HEATING AND VENTILATING

A MONTHLY MAGAZINE FOR ENGINEERS AND CONTRACTORS CONCERNED WITH THE DESIGN AND APPLICATION OF AIR CONDITIONING, REFRIGERATION, PIPING, AIR SANITATION, HEATING AND VENTILATION IN BUILDINGS

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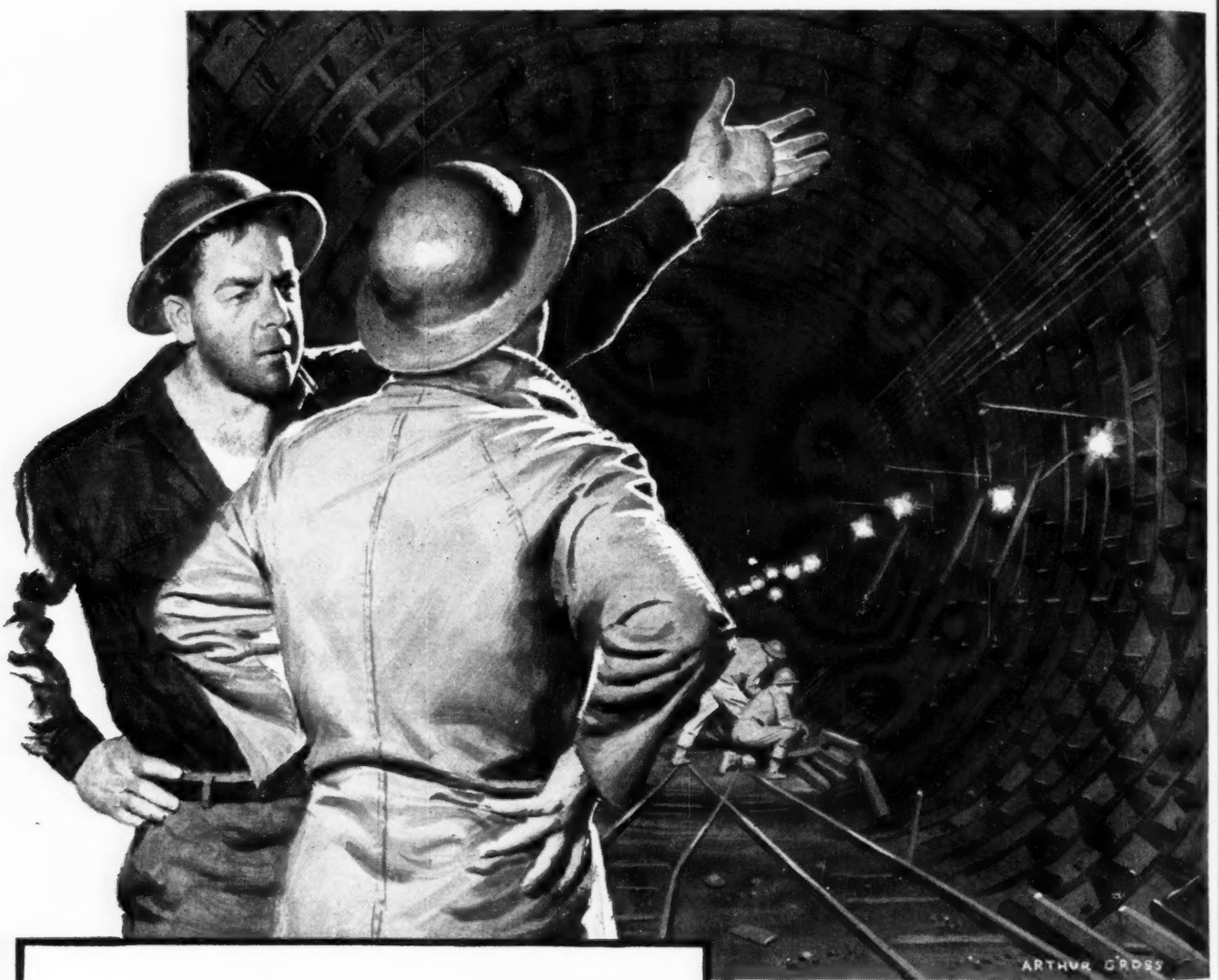
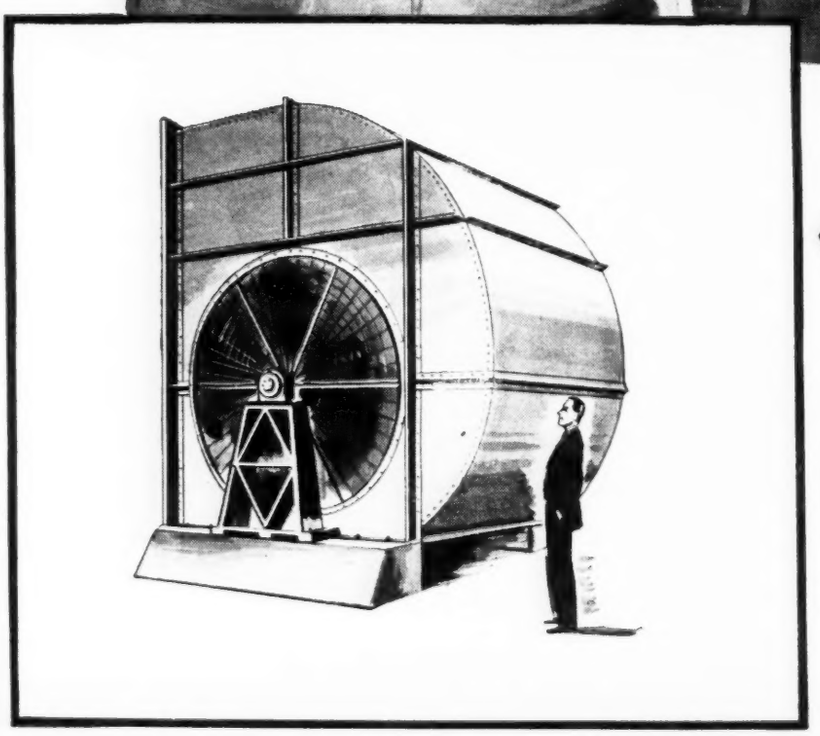
PUBLISHERS OF MACHINERY & MACHINERY'S HANDBOOK
The INDUSTRIAL PRESS

THIS MONTH'S COVER

Benjamin's cocktail lounge, Chicago, Ill., is air conditioned with a self-contained or packaged unit at the rear. For data on the use of self-contained units see the reference section, page 75. Photograph, courtesy General Electric Co.

We'll





One of the Sturtevant Fans
that ventilate the
Brooklyn-Battery Tunnel.

need air-

25,000 TONS EVERY HOUR

Putting *Air* to work . . .

666,000,000 cubic feet of air per hour: that's what the engineers required to ventilate New York's new Brooklyn-Battery Tunnel. And to handle this huge job, they used 53 Westinghouse Sturtevant Fans and Blowers.

You will find Sturtevant-engineered ventilation in tunnels from coast to coast. Oakland-Alameda, Detroit-Windsor, New York's Holland and Queens-Midtown Tunnels, and 7 tunnels on the Pennsylvania Turnpike . . . all are examples of the value that consulting engineers place on the efficiency and dependability of Sturtevant air handling equipment.

You, too, can look to Westinghouse for any air moving, air cleaning or air conditioning equipment. In its broad line, you will find the type best suited to your particular job and the capacity you need—a product of advanced engineering and design. Westinghouse's Sturtevant Division makes more products to put air to work in more different ways than any other manufacturer. For information, write to Westinghouse Electric Corp., Sturtevant Division, Hyde Park, Boston 36, Massachusetts.

Westinghouse Sturtevant Fans and Blowers find wide use in Tunnel Ventilation, Power Plants and all types of Industrial Plants.

YOU CAN BE SURE...IF IT'S

Westinghouse

J-80184

P.A.'S PRAISE

V. S. CHIDLAW, *Purchasing Agent*
American Blower Corporation
Detroit, Mich.

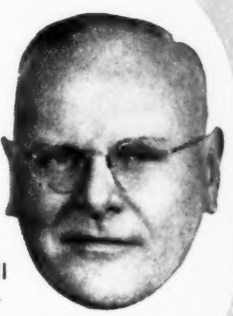
"To keep price control over our inventory, we tie in fractional horsepower motor deliveries closely with our production schedule. That means we've got to have motors shipped on a flexible basis. When we use *standardized* motors, we get just that. We're all for it."

C. W. CLAUSER, *Purchasing Agent*
The Maytag Company
Newton, Ia.

"By using *standardized* motors on our conventional type washing machines, we have avoided a large part of the detail work that would be necessary with special models. Even when we developed the Maytag Automatic washer, we were able to use the same general type of motor with only slight modifications."

G. C. HENTSCHEL, *Purchasing Agent*
Clarke Sanding Machine Co.
Muskegon, Mich.

"We try to meet variations in small motor requirements—but we've still got to watch our costs. It's a definite help to us when we can order a *standardized* motor with all the advantages of a special job and at a price we like."



C. H. KISSEL, *Purchasing Agent*
Gould Pump Company
Seneca Falls, N. Y.

"By using *standardized* fractional-horsepower motors, our distributors and dealers have the full advantage of the motor manufacturer's exchange and service plans. Then we're sure every replacement will do the same job as the original motor."

GENERAL ELECTRIC

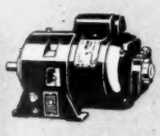
700-101

STANDARDIZATION!

THEY LIKE the simplified buying—
the flexible deliveries—
the absence of inventory problems—
that come with using

STANDARDIZED MOTORS

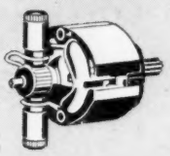
STANDARDIZED Fractional Horsepower MOTORS



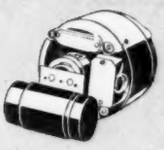
Gear-Motors

Home-Laundry

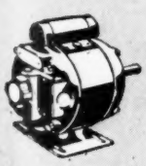
Sump Pump



Series Motors

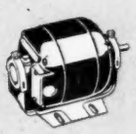


Shaft-Mounted Fan



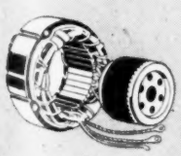
General Purpose

Jet Pump



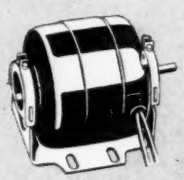
Belted Fan

Gas Pump



Hermetic Refrigeration

Oil Burner



Unit-Bearing Fan

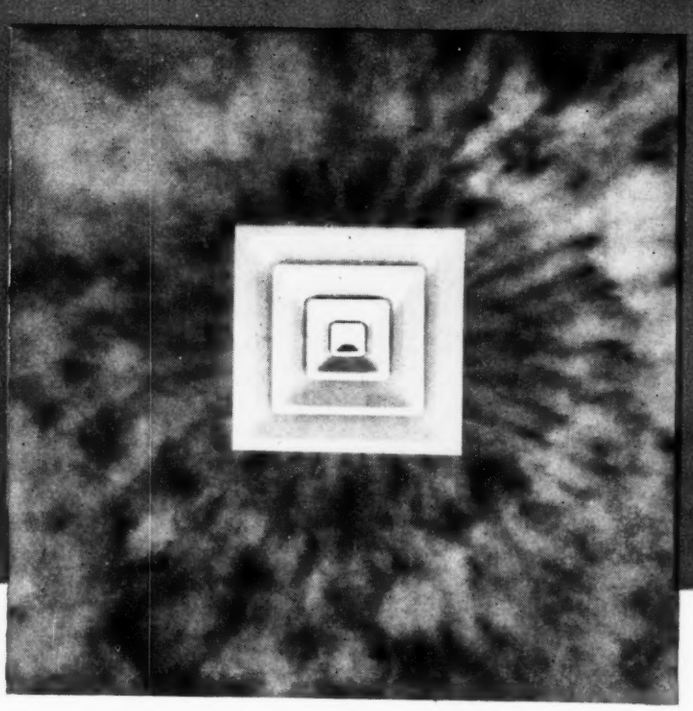
You can cut your motor costs by using G-E standard motors. Expert application engineering service to help you is yours for the asking. Call your G-E fractional-horsepower motor Sales Engineer in the nearby G-E Apparatus Department sales office. For general information on Fractional HP Motor standards, write for Bulletin GES-3565.

Apparatus Dept.
General Electric Company
Schenectady 5, N. Y.

New

360° AIR DISTRIBUTION ***or any required patter***

Photographs of actual smoke tests showing various air patterns obtainable with the Type D Diffuser.



Aerofuse TYPE D
SQUARE DIFFUSER

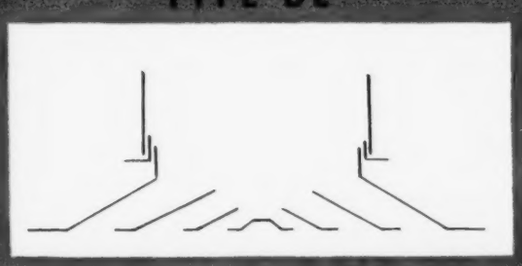
An important addition to the extensive Aerofuse line, the new Type D, is an efficient, smartly styled diffuser developed to answer the increasing demands from engineers and architects for a square outlet that will deliver supply air in a 360° pattern . . . and, in appearance, harmonize with modern building interiors.

Engineered to the highest standards of operating performance, the Type D Aerofuse provides complete flexibility of air pattern. To meet specific job requirements where circular distribution is not practical, baffles may be used to blank-off portions of the diffuser and direct air stream in a variety of patterns. Thus the Type D can be installed near walls, supporting columns and other obstructions without creating drafty conditions.

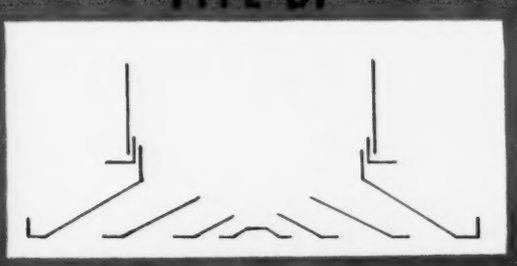
t the vital point of air delivery

Two types are available . . . Type DF, for flush mounting in standard acoustical tile ceilings . . . Type DE, for installation on plaster ceilings. Both types are listed in four sizes (12" x 12", 16" x 16", 20" x 20", 24" x 24", 30" x 30") with neck diameters from 6" to 15".

TYPE DE



TYPE DF



For complete details, size selection information, and engineering data, write for a copy of Catalog 163.

TUTTLE & BAILEY inc

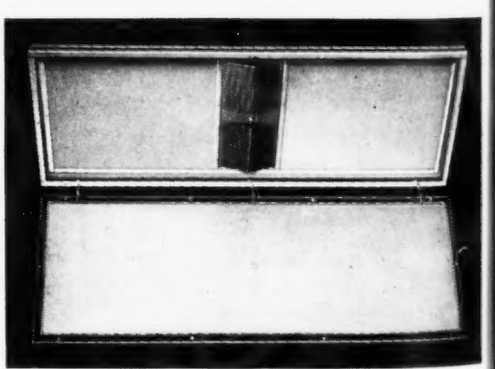
NEW BRITAIN, CONNECTICUT

For *complaint-free* low velocity air distribution

BOND CLOTHES, CLEVELAND, OHIO.
Multi-Vent panels, barely discernible, installed flush in plaster ceilings throughout the building.

Use the Best...

Use
MULTI-VENT *Ceiling Panels*
T.M. Reg. U.S. Pat. Off.



Though the cost of supply and return air outlets is a very small percentage of the overall cost of a good air conditioning system, economizing in the selection of air distribution media is often the cause of complaints from clients on drafts, uneven temperatures, insufficient air, noise and dirty ceilings.

Multi-Vent is better able than any other diffuser to provide widespread uniform air distribution, without these common objectionable conditions because the basic draft, noise and dirt hazards, inherent in all other diffusers, are non-existent in the unique Multi-Vent principle of *distributing air entirely by displacement rather than by high velocity injection.*

In distribution by displacement there are *no* strong air streams to aim and *no* change in air flow pattern when air supply is varied. Regardless of room size, ceiling heights and relative positions of partitions, beams, etc., *all problems of outlet location and air direction adjustments for throw and drop to avoid drafts are eliminated.*

Multi-Vent, moreover, can handle greater amounts of air in proportion to room size than any other diffuser and still maintain a rate of air motion low enough to meet not only the most exacting comfort zone requirements but also to solve the high load and high ventilating problems in critical laboratory and industrial processing areas.

Multi-Vent has many other advantages such as savings in basic heating, cooling and air handling equipment in addition to the important installation, maintenance and decorating economies.

Write for detailed literature and the name of our sales engineer in your vicinity.

MULTI-VENT DIVISION • **THE PYLE-NATIONAL COMPANY** 1374 N. KOSTNER AVE., CHICAGO 51, ILL.

YOUR ENTIRE AIR CONDITIONING SYSTEM WILL BE JUDGED BY THE PERFORMANCE OF THE OUTLETS

MILD SKEPTICISM greeted James Watt's "new" heating idea in 1784. But comfort soon won out over conservatism, and modern heating by radiation was on its way. Today's installations of double-walled Bundyweld Tubing are the perfected development of this ideal heating system.

Bundyweld . . . boon for better radiant heating

TOO BAD Bundyweld wasn't on the market in 1784.

For James Watt would have realized *then*, as designers and builders do *now*, that Bundyweld is ideal for radiant heating panel installations.

It's the only tubing of its kind . . . double-walled from a single strip, copper-bonded throughout. Lightweight and ductile, it's still rugged—musts for easy, efficient installations. More, its double walls are thinner, assuring maximum heat conductivity along with added strength.

Soldering or brazing is a snap; once grids are joined, they can be quickly installed without fear of denting or crushing normally encountered in using softer materials. No kid gloves needed when you handle *this* tubing!

Available immediately in any quantity, Bundyweld is shipped ready for bending right on the job. From the time it arrives on the building site, this miracle tubing of industry racks up real savings in time, labor and costs.

No wonder today's heating experts are hot on Bundyweld. Chances are you will be, too, when you get the whole story. Write for the new Radiant Heating Brochure. *Bundy Tubing Company, Detroit 14, Mich.*

Bundyweld® Tubing

DOUBLE-WALLED FROM A SINGLE STRIP

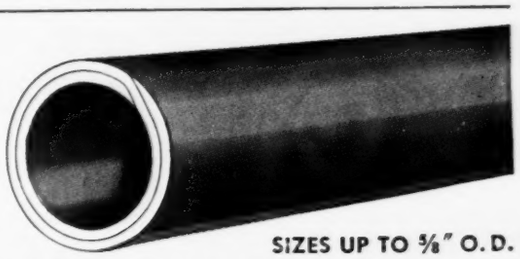
WHY BUNDYWELD IS BETTER TUBING

Bundyweld starts as a single strip of basic metal, coated with a bonding metal. Then it's . . .

continuously rolled twice around laterally into a tube of uniform thickness, and

passed through a furnace. Bonding metal fuses with basic metal, presto—

Bundyweld . . . double-walled and brazed through 360° of wall contact.



SIZES UP TO ⅝" O.D.

Bundy Tubing **Distributors and Representatives:** *Cambridge 42, Mass.:* Austin-Hastings Co., Inc., 226 Binney St. • *Chattanooga 2, Tenn.:* Peirson-Deakins Co., 823-824 Chattanooga Bank Bldg. • *Chicago 32, Ill.:* Lapham-Hickey Co., 3333 W. 47th Place • *Elizabeth, New Jersey:* A. B. Murray Co., Inc., Post Office Box 476 • *Philadelphia 3, Penn.:* Rutan & Co., 404 Architects Bldg. • *San Francisco 10, Calif.:* Pacific Metals Co., Ltd., 3100 19th St. • *Seattle 4, Wash.:* Eagle Metals Co., 3628 E. Marginal Way *Toronto 5, Ontario, Canada:* Alloy Metal Sales, Ltd., 881 Bay St. • **Bundyweld nickel and Monel tubing is sold by distributors of nickel and nickel alloys in principal cities.**

Isn't this a pretty kettle of fish?

SURVEYS reveal an appalling misunderstanding among young people of the "facts of business life." For example, a poll was made among seniors in certain high schools which showed that they believe business profits are "over 50%" of the sales dollar, where actually profits average less than 8%. These students also think that stockholders receive 24% of the sales dollar, where actually it runs less than 3%.

Isn't this a pretty kettle of fish?

A greater part of the 8% of the sales dollar is reinvested in the business to expand and improve plant facilities which protects employment and creates new jobs for more workers.

Such ignorance is alarming. It is unfair to the young people themselves and dangerous to America's future. Such misconceptions open the door to socialism, communism and all the fantasies of the handout or "something-for-nothing" state of the economic dreamers.

Our school teachers say they *want* authentic information on the business system and how it works. Only business itself can supply the facts. You as a business leader in your community must share the responsibility for this misunderstanding. It is our civic duty to help overcome this misconception of everyday economics in the minds of our youth today.

THE YOUNGSTOWN SHEET & TUBE CO. 1900 YOUNGSTOWN 1950 50 YEARS OF SERVICE

The Youngstown Sheet and Tube Company

General Offices -- Youngstown 1, Ohio

Export Offices--500 Fifth Avenue, New York

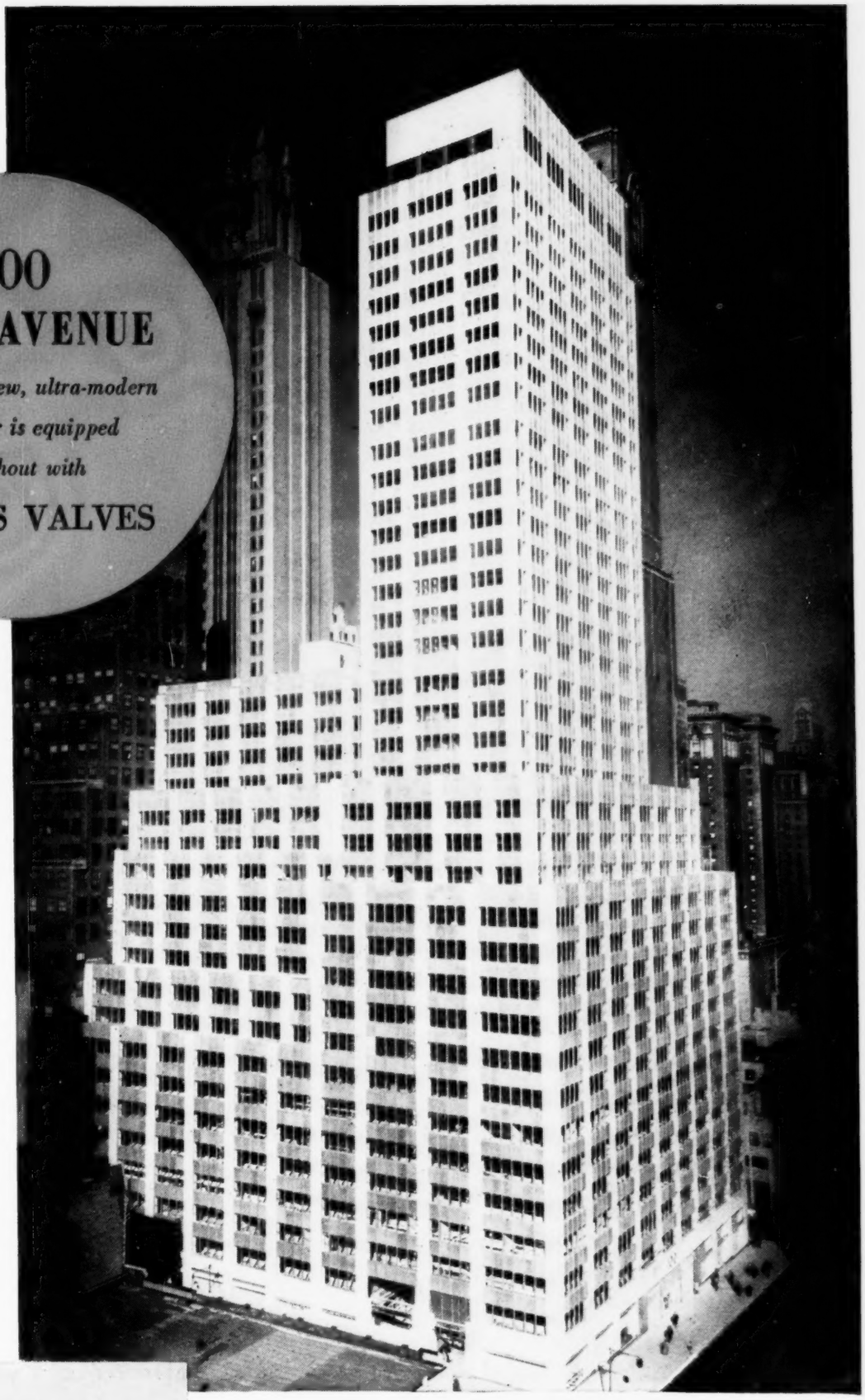
MANUFACTURERS OF CARBON ALLOY AND YOLOY STEELS

ELECTROLYTIC TIN PLATE - COKE TIN PLATE - WIRE - COLD FINISHED CARBON AND ALLOY BARS - PIPE AND TUBULAR PRODUCTS - CONDUIT - RODS - SHEETS - PLATES - BARS - RAILROAD TRACK SPIKES.

100 PARK AVENUE

New York's new, ultra-modern skyscraper is equipped throughout with

JENKINS VALVES



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KERBY SAUNDERS, INC.
Heating, Ventilating and Air Conditioning Contractors

JARCHO BROS.
Plumbing Contractor

JENKINS VALVES

LOOK FOR THE DIAMOND MARK

SINCE 1864

TRADE JENKINS MARK

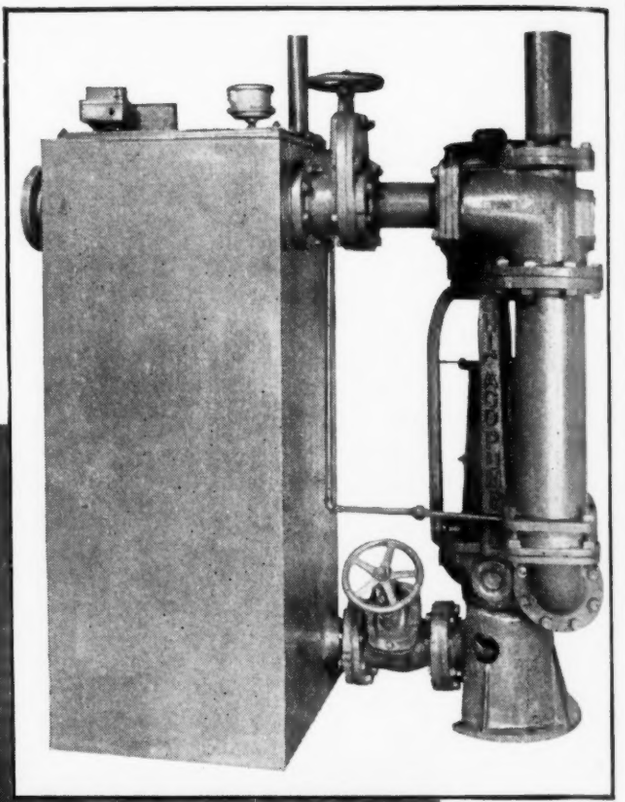
Jenkins Bros.

4715 JENKINS VALVES! At 100 Park Avenue, as in all large buildings and plants, the many valves required represent a major investment. Obviously, maintenance costs would become excessive if valves proved inferior. That is why, today, when low-cost operation is a controlling factor in construction and modernization plans, so many builders take the long view of valve economy. They choose Jenkins Valves, for proved endurance. Despite their extra value, you pay no more for Jenkins Valves. *Sold through leading Industrial Distributors everywhere.* Jenkins Bros., 80 White Street, New York 16; Jenkins Bros., Ltd., Montreal.

CLOG-PROOF

•

RELIABLE



There's no substitute for The "Chicago"

FLUSH-KLEEN

Sewage Ejector of Proved Performance

"Flush-Kleens" are positively clog-proof . . . the impellers handle nothing but strained sewage, minimizing wear and maintaining pump balance. Specially designed for plumbing systems in buildings where the maximum inflow is not more than 50 GPM. A second unit can be added any time, to make a duplex installation.

Look at These Long-established Facts

- "Flush-Kleens" are the only absolutely clog-proof sewage pumps; impellers are not required to pass any solids.
- The "Flush-Kleen" will pump anything that will pass through the pipe regardless of type or quantity of material.
- "Flush-Kleen" needs no manual attention other than lubrication and inspection. No labor is needed to dis-assemble and clean.
- "Flush-Kleen" selection is not limited to a narrow pumping range. The impeller maintains dynamic balance over a wide range, preventing strain on shaft and bearing.

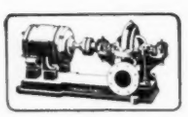
Write for further information and test data on Chicago Pump Company "Flush-Kleen" Sewage Ejectors.

CHICAGO PUMP COMPANY

BUILDING and INDUSTRIAL DIVISION

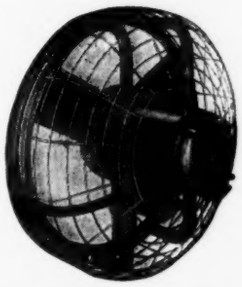
2300 WOLFRAM STREET **CHICAGO 18, ILLINOIS**

Condo-Vac, Sure Return, AVC, LVC
Fire, House & Circulating Pumps
Pneumatic & Tankless Water Systems



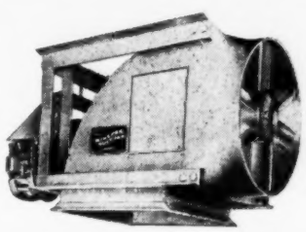
Flush-Kleen Sewage Ejectors
Little Giant & Non-Clog Bilge Pumps
Pumps for every industrial use.

WING VENTILATING EQUIPMENT



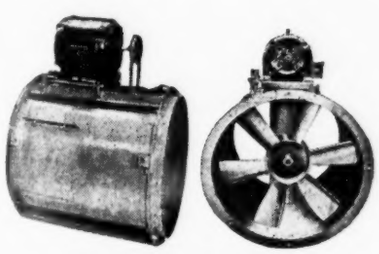
WINGFOIL SAFETY VENTILATING FAN

Distinguished for efficiency and rugged construction. The new Wingfoil fan wheel moves maximum volumes of air with minimum horsepower, due largely to its non-overloading feature. Sizes from 10" to 60" dia., with free air capacities from 825 to 59,000 CFM. Larger sizes on special order. Either direct or belt drive. Heavy steel guards provide safety.



WINGFOIL DUCT FAN
(Elbow Type)

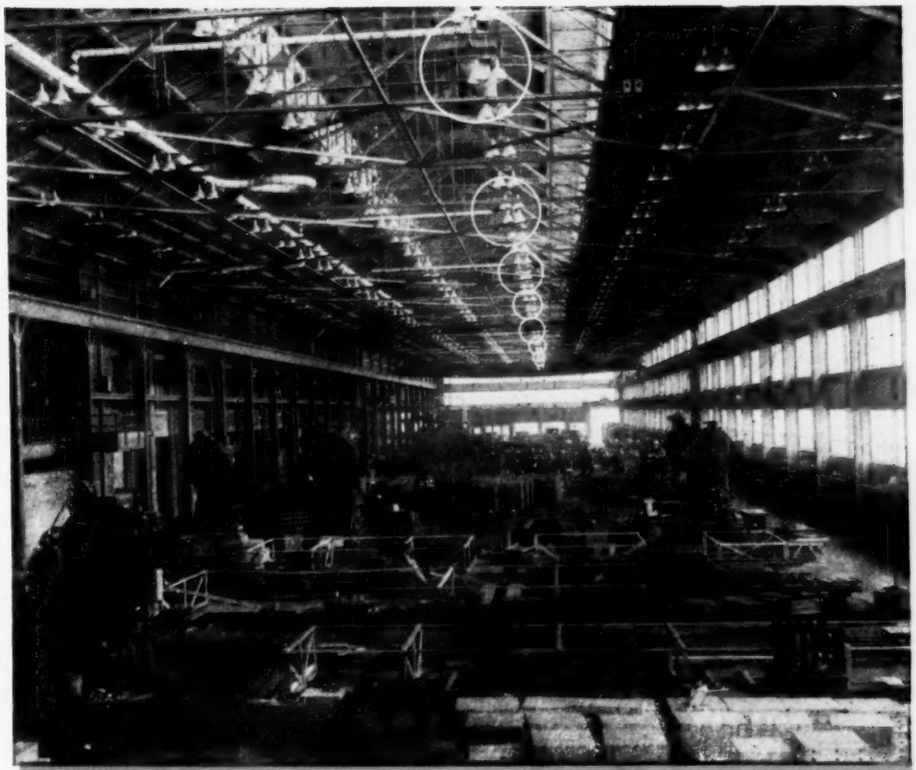
Designed to form an elbow in the duct system, the elbow-shaped housing in a strong rectangular frame permits installation with the inlet in any desired position. Motor and drive are outside the air stream, therefore remain cool, clean, and easily accessible. The new Wingfoil Fan has a remarkable "non-overloading" characteristic. Sizes 10" to 60"; capacities up to 85,000 CFM.



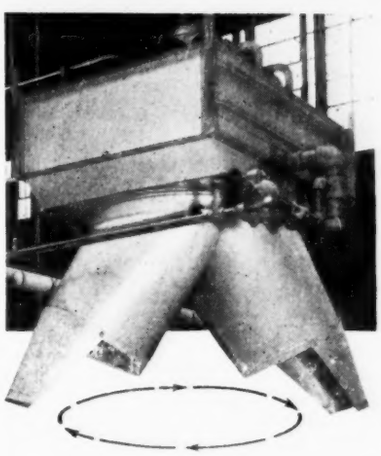
WINGFOIL DUCT FAN
(Straight Line Type)

Designed to form a part of any straight run of duct. The motor is mounted on an adjustable base outside of the housing. V-belt drive is through an air tube carried across the housing and supporting fan shaft and bearings. Fan wheel is the new non-overloading Wingfoil Fan. Bearings are grease-sealed, requiring minimum of attention.

WRITE FOR BULLETINS



Perfection Stove Sought Perfection in Factory Heating



In Perfection Stove Company's new Ivanhoe plant at Cleveland, Ohio, the problem of heating the press building (shown above) was solved by the installation of 9 WING Revolving Unit Heaters. This building is 855 ft. long by 112 ft. wide with the peak of the truss roof 66 ft. from floor. Lowest edge of the heaters is 44 ft. above floor level. The heat output is evenly distributed by the discharge outlets which revolve slowly and continuously. "We wanted equalized no-draft heating," says C. J. Kessler, Perfection Stove's Production Engineer, "and we got it."

Write for a copy of WING Bulletin HR-5

L. J. Wing Mfg. Co.

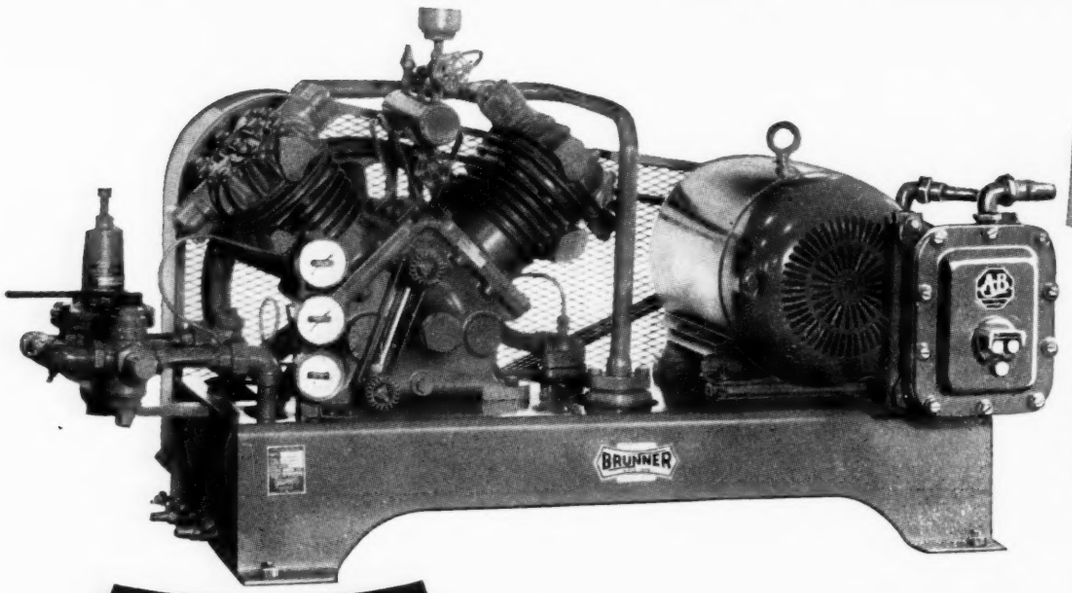
158 Vreeland Mills Road
Linden, N. J.

Canadian factory: Montreal.

WING

Wing

Revolving UNIT HEATERS

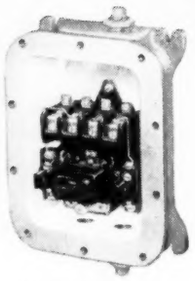


The Brunner LPG (Liquefied Petroleum Gas) Compressor Unit is equipped with an explosion-proof motor and an A-B Solenoid Starter in a NEMA Type 7 enclosure for hazardous gas locations.

BRUNNER COMPRESSOR UNITS

equipped with

A-B Quality Trouble Free Motor Controls



A-B Bulletin 709 Solenoid Motor Starter in NEMA 7 enclosure. Air break contacts. Gray enamel finish. White interior.

WHY ARE ALLEN-BRADLEY STARTERS SO POPULAR for air-conditioning service? . . . Because they are trouble free. Only one moving part. No pivots, pins, or bearings to corrode or stick . . . no jumpers to break. You install them . . . and forget them!

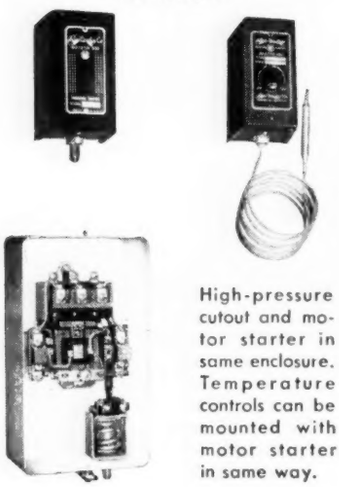
NO CONTACT MAINTENANCE. Allen-Bradley patented silver alloy contacts never need cleaning, filing, or dressing.

DEPENDABLE OVERLOAD RELAYS. Allen-Bradley thermal relays are accurate and dependable even after long service.

The A-B trademark stands for millions of trouble free operations. Allen-Bradley Co., 1330 S. Second St., Milwaukee 4, Wisconsin.

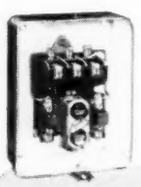
ALLEN-BRADLEY AIR-CONDITIONING AND REFRIGERATION CONTROLS

PRESSURE AND TEMPERATURE CONTROLS

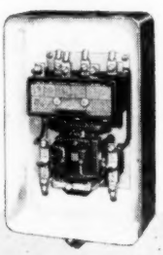


High-pressure cutout and motor starter in same enclosure. Temperature controls can be mounted with motor starter in same way.

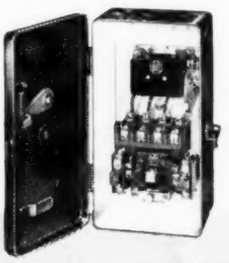
MANUAL STARTER



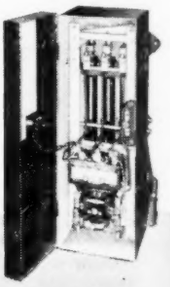
AUTOMATIC STARTER



COMBINATION STARTER



HEAVY COMPRESSION STARTER



ALLEN-BRADLEY

SOLENOID MOTOR CONTROL

American Blower—a time-honored name in air handling

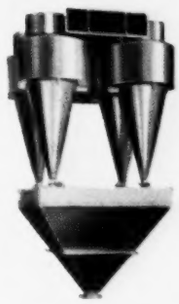
Cleveland, as in other cities, American Blower Air Handling ducts serve commerce, industry and public utilities. For air handling data in the Cleveland area, call American Blower—Main 60. In other areas, consult your phone book.

Venturafin Unit Heaters

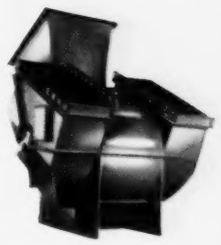
Type TM Gyrol Fluid Drives

Utility Sets

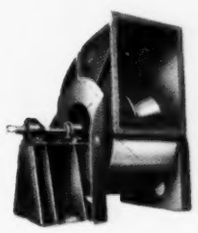
Ventura Ventilating Fans



Dust Collectors

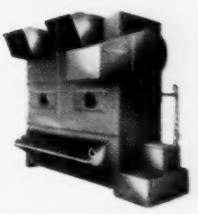


Mechanical Draft Fans



Industrial Fans

Heating and Cooling Coils



Air Conditioning Equipment

It pays to look before you buy. Air handling equipment differs widely in quality, design, quietness, operating costs and efficiency. Comparative tests by many buyers have thoroughly proved the superiority of American Blower Air Handling Equipment.

Air is free . . . use it profitably!

You've read how it will pay you to investigate the advantages of putting air to profitable use in previous American Blower advertisements.

Now, here are actual examples of what some companies are doing about it—

A large automotive manufacturer recently added *115* new American Blower Ventilating Fans in just *one* plant.

A midwest power company purchased *40* American Blower Heavy Duty Coils as air heaters for boilers.

A large life insurance company installed 260 American Blower Utility Sets to ventilate a new apartment building on the West Coast.

These buyers know that it pays to use air profitably. They insist on the highest-quality equipment. Many of them have run tests on several makes of equipment before buying American Blower products.

If you would like to know more about these fine products, how they can be applied profitably to your business, or how you, as a contractor, can profitably apply them, phone our nearest branch office.

AMERICAN BLOWER CORPORATION, DETROIT 32, MICHIGAN
CANADIAN SIROCCO COMPANY, LTD., WINDSOR, ONTARIO
Division of American Radiator & Standard Sanitary Corporation

YOUR BEST BUY

AMERICAN BLOWER

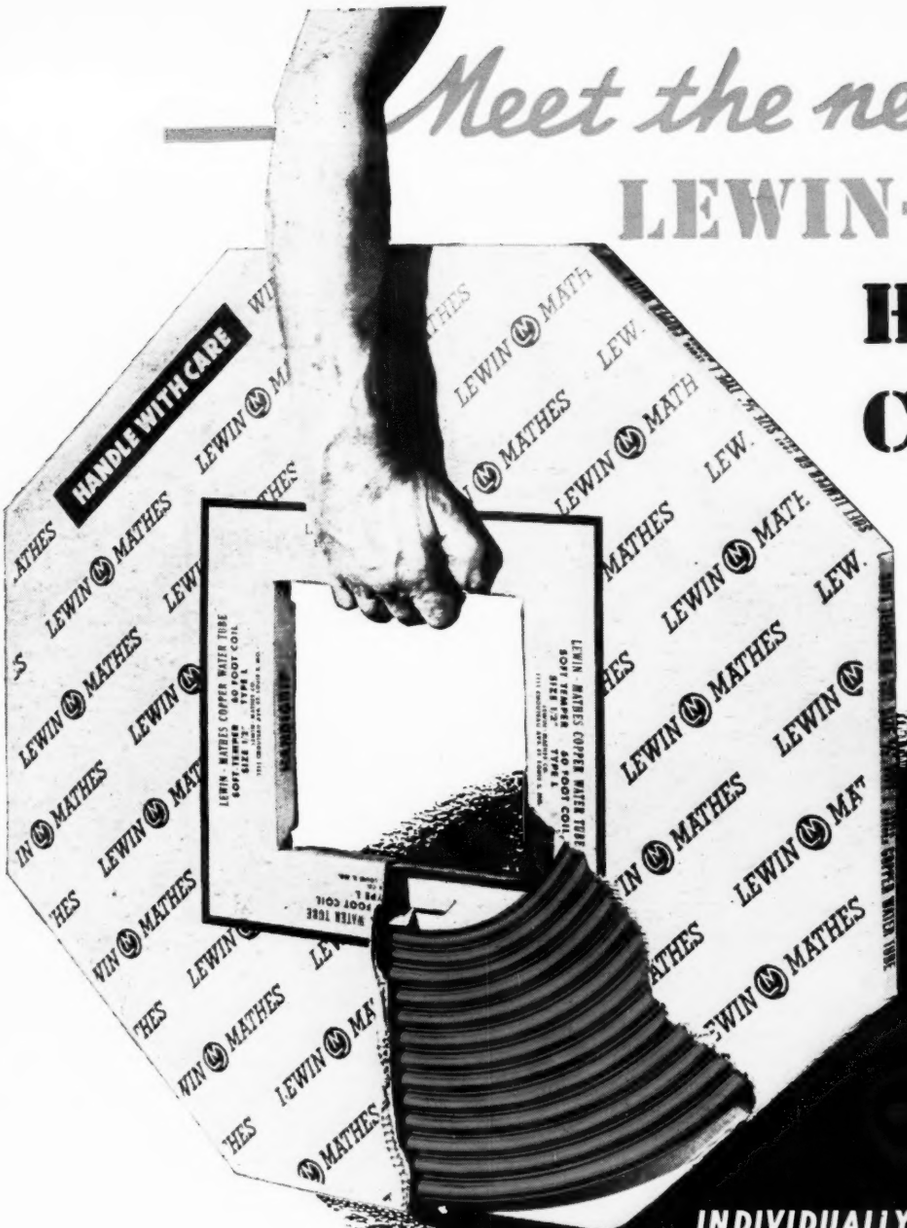
AIR HANDLING EQUIPMENT

Serving home and industry

AMERICAN-STANDARD • AMERICAN BLOWER • CHURCH SEATS • DETROIT LUBRICATOR • KEWANEE BOILERS • ROSS HEATER • TONAWANDA IRON

Meet the new

LEWIN-MATHES HANDIGRIP CARTON*



...the sturdiest, handiest carton ever built for individual copper tube coils

INDIVIDUALLY PACKED FOR RESHIPMENT

- FROM MILL TO JOB — rigid *Handigrip* Cartons protect and support coil from 12 points!
- HANDIER TO STOCK — stacks compactly or hangs up!
- HANDIER TO PICK UP — and carry!
- HANDIER TO IDENTIFY — size and type easy to read!

LEWIN-MATHES COPPER TUBING . . . . . . the only tubing protected in eight-sided cartons

*PATENT APPLIED FOR

LEWIN-MATHES

LEWIN-MATHES COMPANY · · SAINT LOUIS, MISSOURI

The cafeteria of a large insurance company in New York City. • **Architect:** T. H. Engelhardt • **Engineer-Contractor:** Buensod-Stacey, New York, N. Y.

A PROBLEM
IN
Beauty and Balance

...solved by **kno·draft** adjustable air diffusers

The air-conditioning problem in this company cafeteria was to select air diffusers that would "go" with its rich design and, at the same time, balance the great heat differential between the serving and the dining area.

Kno-Draft *Adjustable* Air Diffusers solved both problems.

Notice how well Kno-Draft's clean, concise lines harmonize with paneling and chandeliers. Take a satisfied user's word for it that the pattern of air flow provides equalized temperature and thorough distribution—*without draft*—throughout the entire area.

With Kno-Draft *Adjustable* Air Diffusers, both air volume and direction are completely and easily controlled *after* installation. A screw driver is the only tool needed. Kno-Draft Air Diffusers are as much "at home" in modern as in traditional surroundings . . . and there are types and sizes to meet every requirement.

KNO-DRAFT DATA BOOK: Complete specifications, engineering and installation data on Kno-Draft *Adjustable* Air Diffusers. To get your copy, simply fill in and mail the coupon. No obligation, of course.

W. B. CONNOR ENGINEERING CORP.
114 East 32nd Street, New York 16, N. Y.
Air Diffusion • Air Purification • Air Recovery
In Canada: Douglas Engineering Co., Ltd.,
190 Murray Street, Montreal 3, P. Q.

W. B. CONNOR ENGINEERING CORP.
Dept. J-60, 114 East 32nd Street, New York 16, N. Y.

Please send me, without obligation, my copy of the Kno-Draft Air Diffuser Data Book.

Name.....

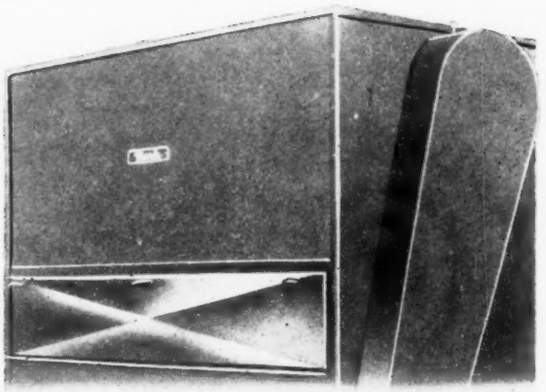
Position.....

Company.....

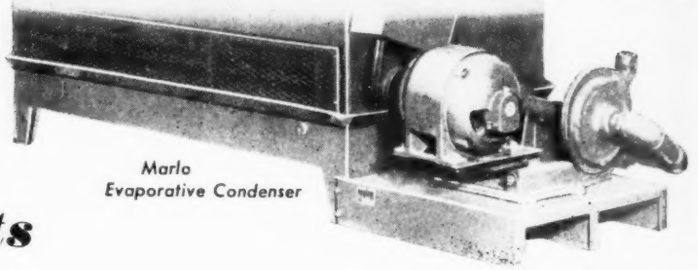
Street.....

City.....**Zone**....**State**.....

SAVED *day after day...*



up to 95%... ***...of normal water demand***



Marlo
Evaporative Condenser

with Marlo cooling units

Engineered for more efficient re-cycle cooling, Marlo Evaporative Condensers and Cooling Towers cut cooling water consumption up to 95%—a substantial and **steady** saving your clients can count on . . . just **one** of the big Marlo economies.

Other Marlo features that mean better installations for you . . .

Durability . . . Marlo Units last longer—with all galvanized construction that resists corrosion.

Quietness . . . Sound-deadening interiors, silent V-belt drive assure low noise-level operation.

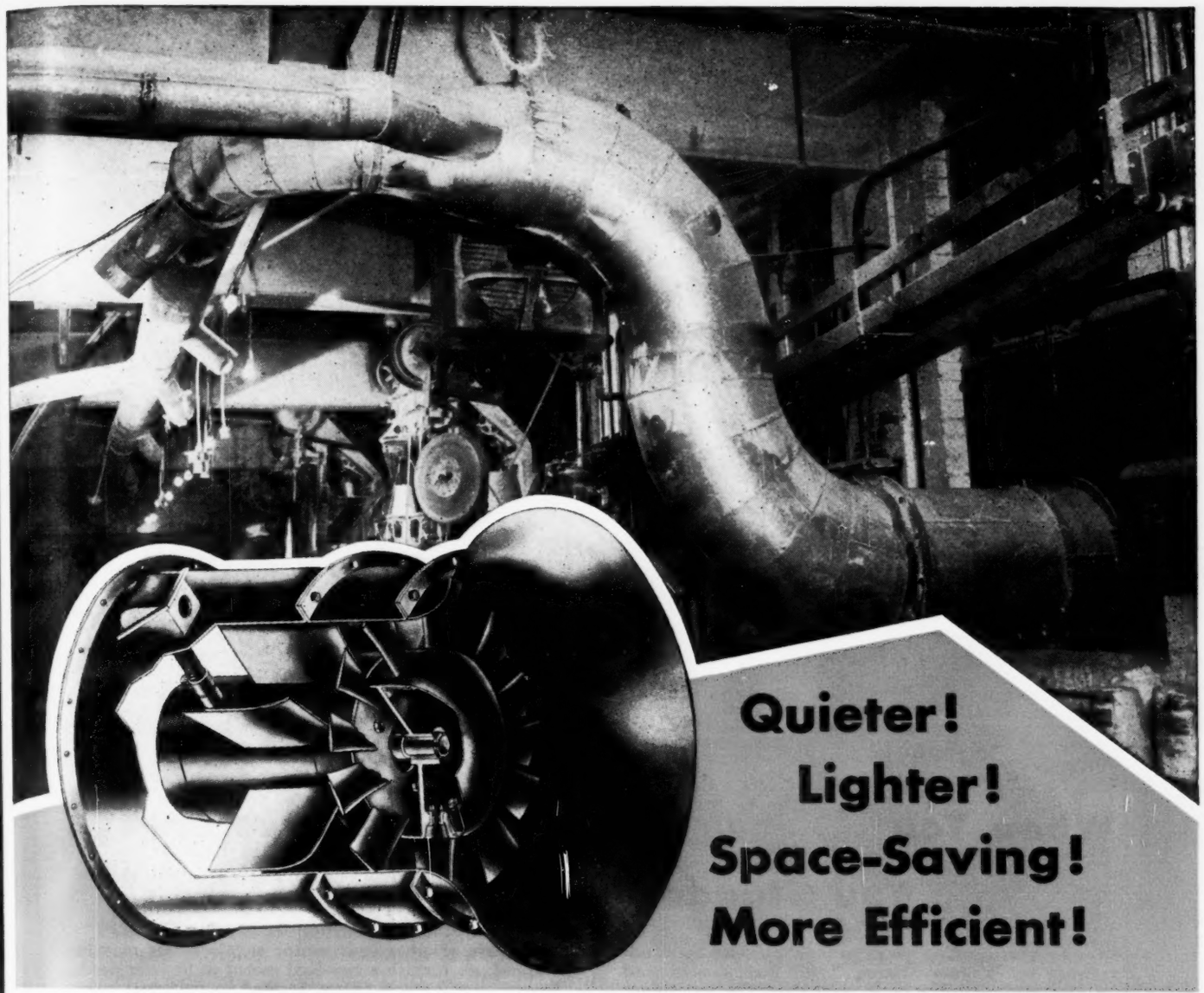
Compactness . . . Marlo Units are installed easily—with minimum expense.

Accessibility . . . for fast, simple, economical servicing.

Write for complete details on Marlo Evaporative Condensers and Cooling Towers.

MARLO : HEAT TRANSFER
Since 1925

Marlo COIL CO. • 6135 Manchester Rd. • St. Louis 10, Mo.



JOY AXIVANE* FANS

(SERIES 1000)

Write for Bulletin, or

Consult a Joy Engineer

The quieter operation, lighter, more compact design, lower power consumption and unmatched efficiency of JOY Axivane Fans are *real* advantages! What's more, their vaneaxial design and in-line construction permit mounting right in the air duct, making installation simple and saving greatly on time and cost. These features, plus the extreme flexibility of operating range made possible by adjustable blades—a standard feature of all JOY Fans—mean better, more dependable and lower-cost ventilation, no matter what your conditions are.

● Let JOY Axivane Fan specialists work with you for best results on your ventilation jobs.

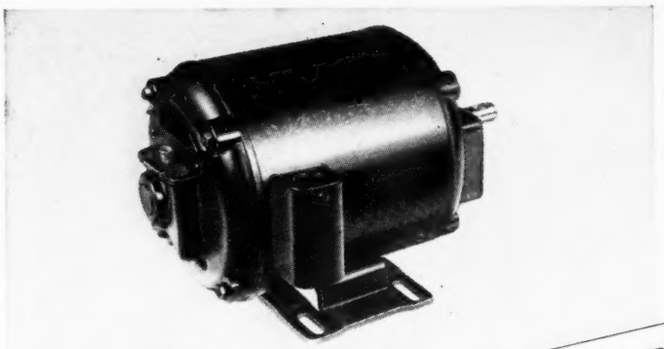
*Reg. U. S. Pat. Off.

W&D 12355

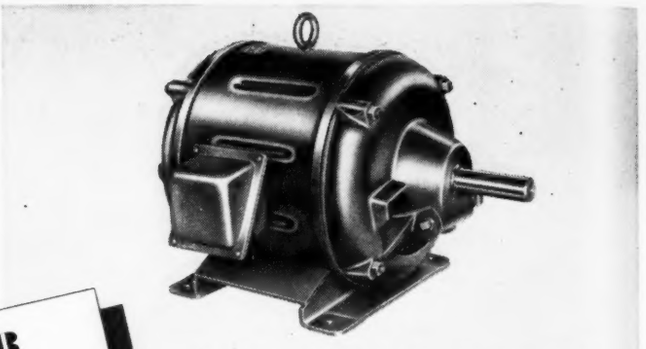
JOY MANUFACTURING COMPANY

GENERAL OFFICES: HENRY W. OLIVER BUILDING · PITTSBURGH 22, PA.

IN CANADA: JOY MANUFACTURING COMPANY (CANADA) LIMITED, GALT, ONTARIO

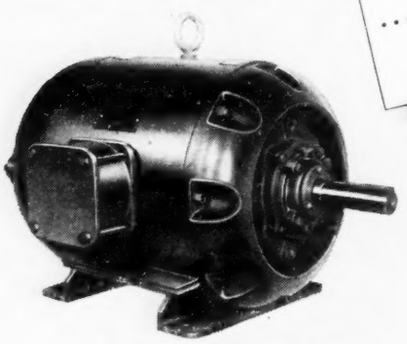


Repulsion Start Induction Motor
⅙ to 15 hp.

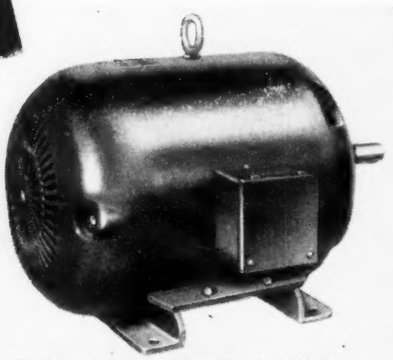


Open-type, Polyphase Squirrel Cage Motor
⅙ to 400 hp.

WAGNER MOTORS
...The choice of leaders in industry



Explosion-Proof Motor
½ to 200 hp.



Totally-enclosed, Fan Cooled Motor
1½ to 200 hp.

When You *Standardize* on Wagner Motors . . .
You Standardize on *Quality!*

Give an added selling point to your product by standardizing on Wagner Motors. Their high quality and steadfast dependability have made them the first choice of many manufacturers and industrial plants. If you need motors that will give troublefree service and build customer satisfaction choose Wagner Motors.

Regardless of what your motor requirements may be, Wagner can furnish a standard motor to fit your needs. Twenty-nine branch offices, located in principal cities, are ready to help you. Write for Bulletin MU-185 for information on the complete line of Wagner Motors.

You'll Save Time, Money, Worry, Because:

- Wagner Motors are immediately available from Wagner Branches in principal cities.
- Improved engineering features assure long life and efficient operation.
- Wagner Motors are backed by a liberal warranty.
- They are available in a wide range of types and sizes for every application.
- More than 450 Wagner Authorized Service Stations and Parts Distributors *plus* 25 Wagner-owned Service Branches provide on-the-spot service, genuine repair parts, or replacement motors.

Wagner Electric Corporation
EST. WE 1891

WAGNER ELECTRIC CORPORATION
6463 Plymouth Ave., St. Louis 14, Mo., U.S.A.

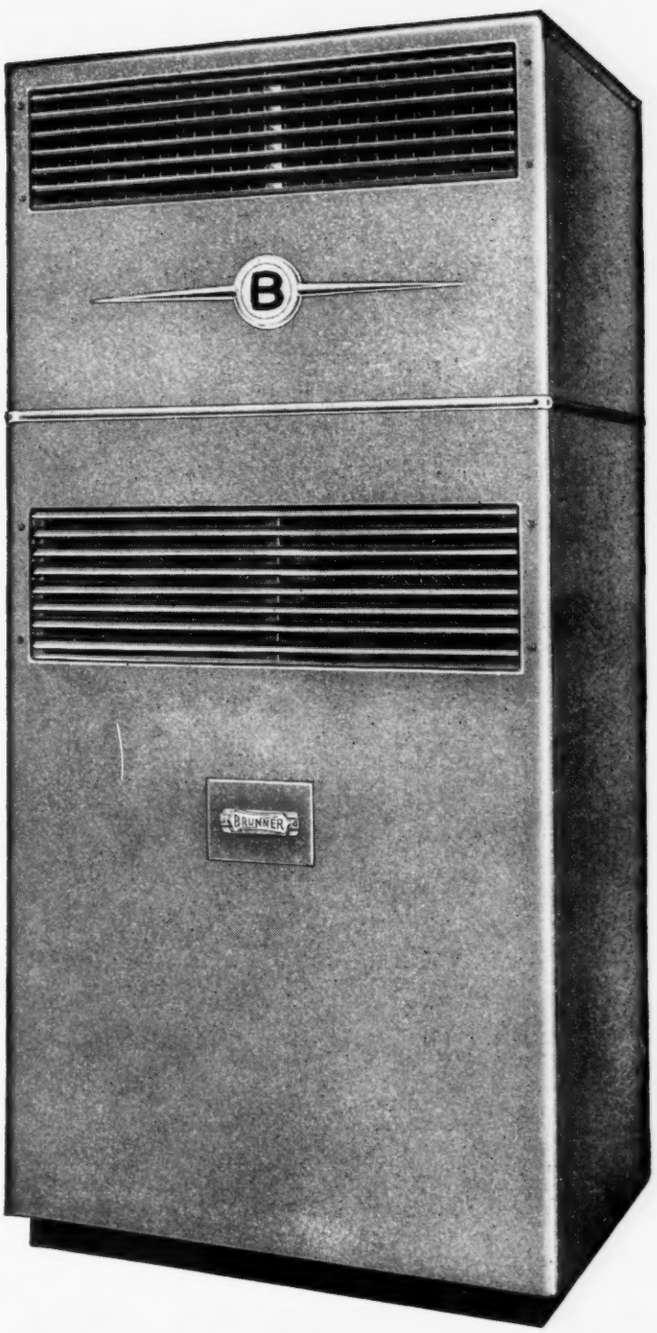
ELECTRIC MOTORS • TRANSFORMERS • INDUSTRIAL BRAKES
AUTOMOTIVE BRAKE SYSTEMS — AIR AND HYDRAULIC

M50-5

BRANCHES IN 29 PRINCIPAL CITIES

BRUNNER SINCE 1906

AIR CONDITIONING builds business



"Packaged" AIR CONDITIONING

. . . as easy to sell as cornflakes!

Air Conditioners are as much a part of the heating and plumbing contractor's business as cornflakes are a grocery store item...and as easy to sell.

Every business depending upon human traffic for the moving of merchandise recognizes customer comfort as the No. 1 attraction, therefore your potential customers are all those retail type businesses in the area you serve.

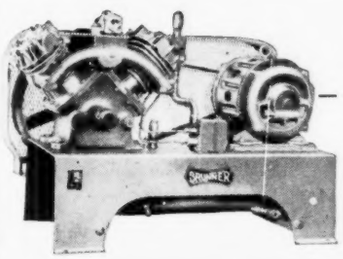
Brunner has the units . . . four popular sizes of self-contained air conditioners that provide you the *right* answers to every question of appearance, price, design, dependability and long self-amortizing service life. And packaged air conditioning is a clean and simple installation job.

● *Your letter requesting literature and complete information will lead the way to another source of good volume and good profits.*

BRUNNER SINCE 1906

AIR CONDITIONING

- **Self Contained 3 HP. to 10 HP.**
- **Remote Type 5 HP. to 75 HP.**



BRUNNER MANUFACTURING CO., Utica 1, New York, U.S.A.

REFRIGERATION CONDENSING UNITS by

AIR AND WATER COOLED MODELS—*a size and type for every purpose...*¼ **HP. TO 75 HP.**

BRUNNER SINCE 1906

Nothing heats better than Modine Convector Radiation . . . NOTHING LOOKS MORE BEAUTIFUL IN A BEAUTIFUL ROOM

To find out why the new Modine Convector is the *better* way to heat apartments, homes, schools, offices or hospitals, call your Modine Representative. He's listed in the "Where-to-Buy-it" section of your phone book. Ask to see a sample, or write direct. Modine Mfg. Co., 1511 Dekoven Avenue, Racine, Wisconsin.

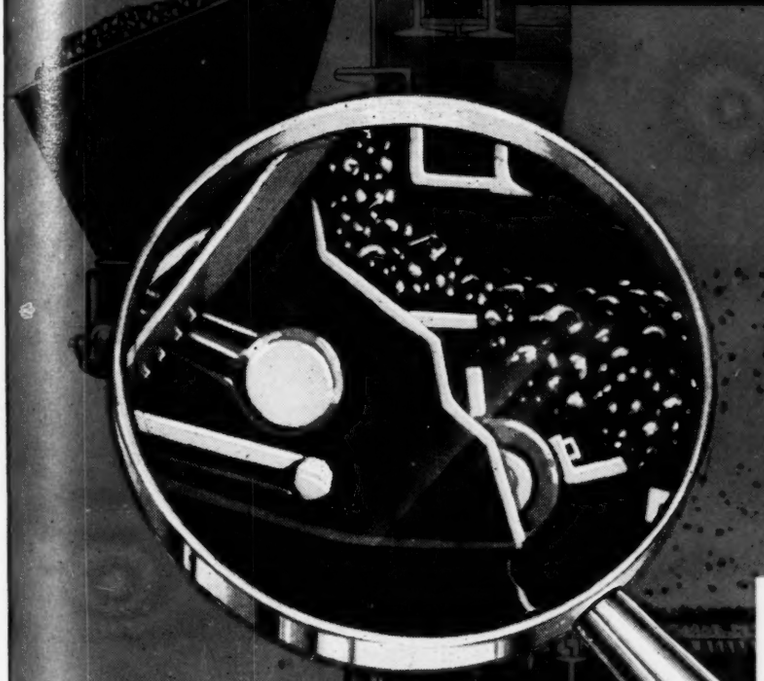
Send for New Modine Convector Catalog Today!

Design and Mechanical Patents Pending

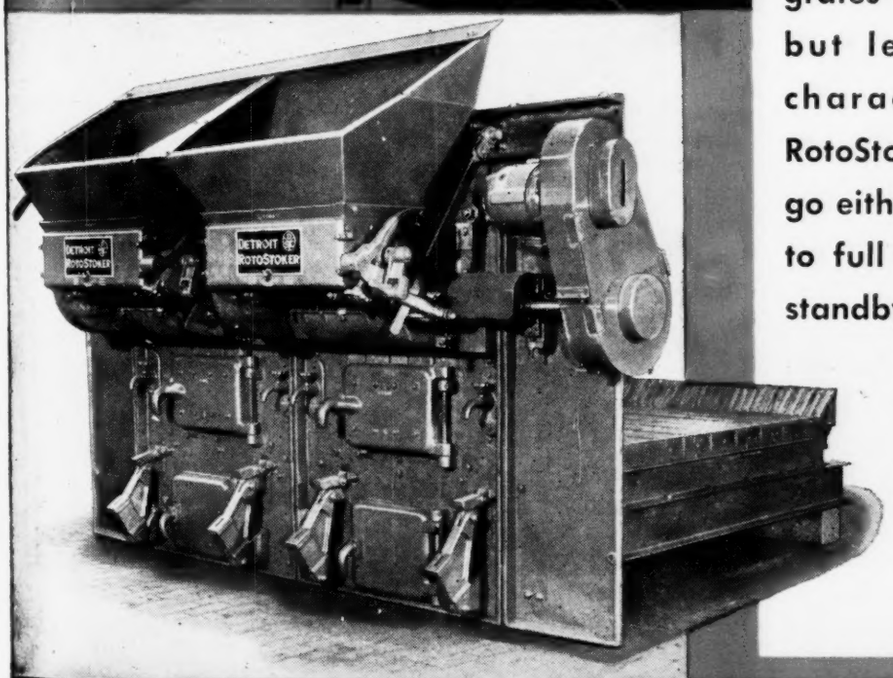
Modine
CONVECTORS

R-1049

It's the OVERTHROW ROTOR *that does the* TRICK



DETROIT ROTOSTOKER



A spreader stoker with an **OVERTHROW ROTOR** that assures dependable and uniform fuel distribution. Fuel is burned partially in suspension and partially on the grates with a comparatively thin, but level fuel bed. Burning characteristics are such that RotoStoker equipped boilers can go either from a banked condition to full load—or from full load to standby in a few minutes. Banking losses are negligible, as only a small amount of coal is carried on the grates at any time.

Write for Bulletin.

DETROIT STOKER COMPANY

GENERAL MOTORS BUILDING, DETROIT 2, MICHIGAN

District Offices in Principal Cities • Works at Monroe, Michigan

A *Curtis* Franchise

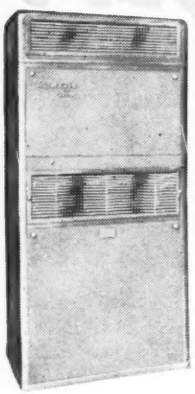
IS BECOMING MORE AND

MORE PROFITABLE

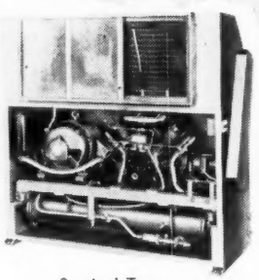
BECAUSE OF NEW ADDITIONS TO THE LINE

2, 4, 6, 8-Ton Packaged Units
10 and 15-Ton Central Type Package Units
Condensing Units — 1/4 H. P. Thru 40 H. P.

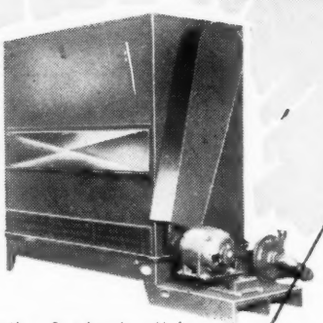
and



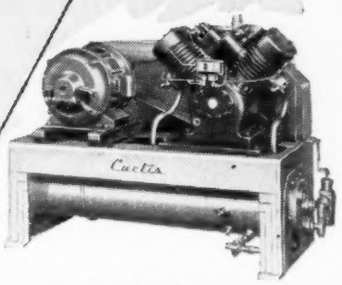
2, 4, 6, 8-Ton Packaged Air-Conditioning Units



Central Type 10 and 15 Ton



Evaporative Condensing Units, Cooling Towers and Air Handling Units



Water Cooled Condensing Units 1/4 H.P. thru 40 H.P.

Distributors have long known of the unsurpassed quality and performance record of Curtis equipment. Now, because of the strong continued National Advertising Campaign, users of air conditioning are asking for Curtis. They know it as a quality product.

This broad line permits Curtis distributors to handle air-conditioning jobs profitably.

Powerful National ADVERTISING

FULL PAGES IN

Saturday Evening Post *Time* *Newsweek*

and many other publications

Curtis REFRIGERATION AIR CONDITIONING COMMERCIAL

96 Years of Successful Manufacturing

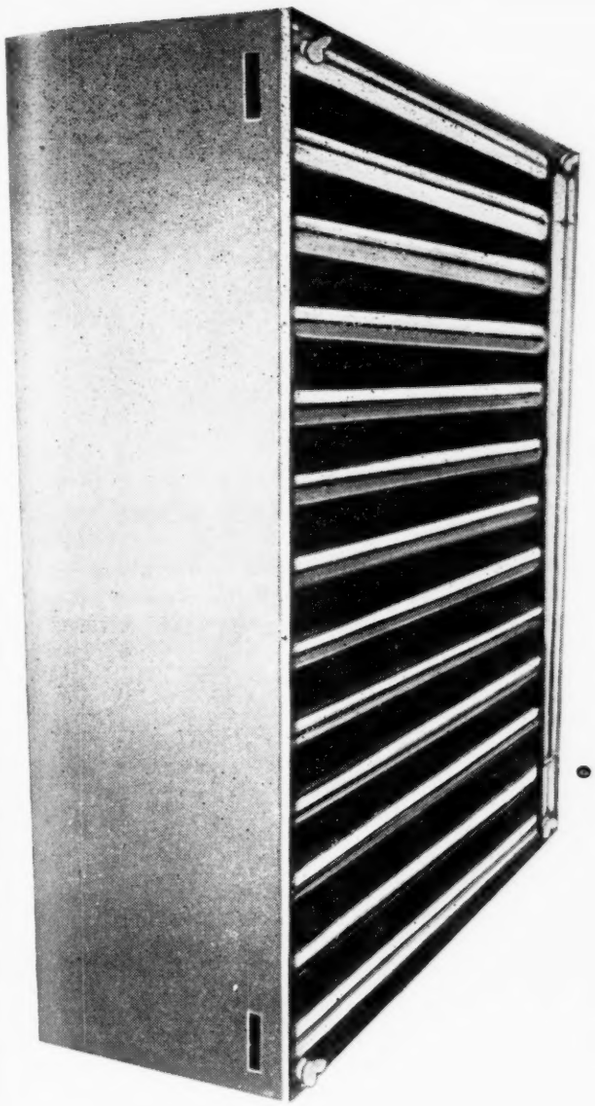
Curtis

CURTIS REFRIGERATING MACHINE DIVISION

of Curtis Manufacturing Company

1999 Kienlen Ave. • St. Louis 20, Missouri

R50-6



We sell "C" cells

. . . that materially reduce the cost of air conditioning

The picture shows a Dorex Type C Air Recovery Cell. In an air conditioning system or unit, it purifies the air, improves ventilation, saves cooling and heating costs by reducing necessary intake of new, outside air as much as two-thirds.

Notice the "accordion pleats." They contain Dorex *Activated* Carbon. As used air flows through the "C" Cell, this special carbon extracts and retains all odorous, vaporous and gaseous impurities—just as a gas mask would. Stale air is purified, made fresh and completely reusable.

A double saving results from the use of Dorex Type C Air Recovery Cells. (1) Initial air conditioning equipment costs are less because, obviously, less heating and cooling capacity will be required. (2) Operating costs come down—because it costs only about half as much to freshen used air as to condition new air.

Dorex Air Recovery has proved its effectiveness in more than 6,000 installations over the past 20 years. If you do not have complete information in your files on how Dorex works, who uses it, and its great advantages to you and your clients—let us send it to you. Just mail the coupon below.

"WORKS LIKE A GAS MASK"

DOREX

Air Recovery

W. B. CONNOR ENGINEERING CORP.
114 East 32nd Street, New York 16, N. Y.
Air Diffusion • Air Purification • Air Recovery
In Canada: Douglas Engineering Co., Ltd.,
190 Murray Street, Montreal 3, P. Q.

W. B. CONNOR ENGINEERING CORP.
Dept. B-60, 114 East 32nd Street, New York 16, N. Y.

Please send me, without obligation, full information on Dorex Air Recovery.

Name.....

Position.....

Company.....

Street.....

City..... **Zone**.....**State**.....

POWERS
FLOWRITE
VALVE

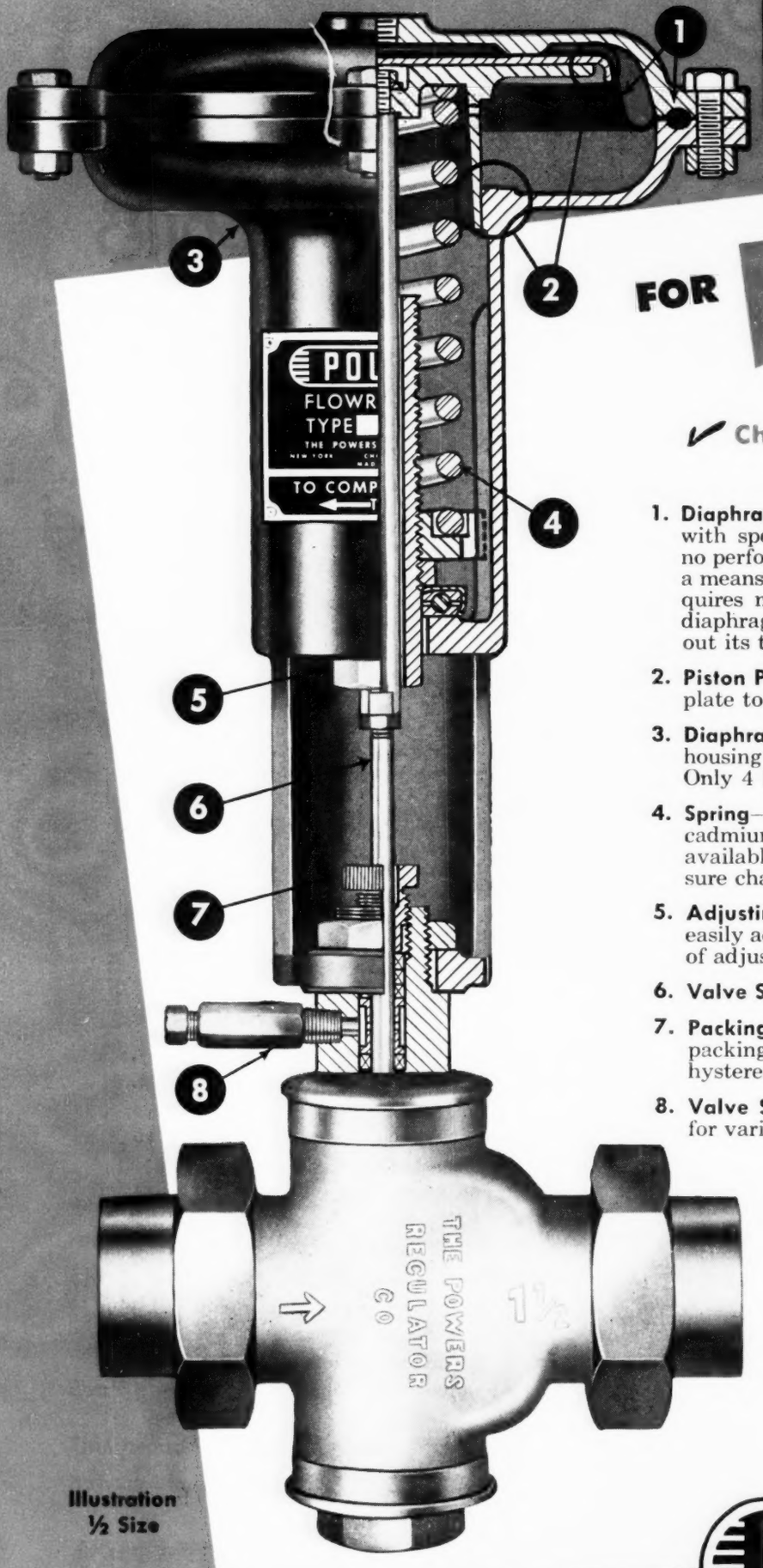


Illustration
½ Size

FOR BETTER CONTROL

✓ Check these Features of *NEW* POWERSTROKE TOP!

1. **Diaphragm**—Long life moulded Neoprene diaphragm with specially designed leak-proof sealing ring. Has no perforations or bolt holes. Diaphragm ring supplies a means for self-sealing under increasing pressure. Requires minimum of force for compression. Shape of diaphragm provides a constant effective area throughout its travel.
2. **Piston Plate**—Accurately guided self-aligning piston plate to eliminate side thrust.
3. **Diaphragm Housing**—Special high quality cast iron housing and top for ruggedness and corrosion resistance. Only 4 bolts are used to permit easy removal of top.
4. **Spring**—Enclosed special alloy steel calibrated spring, cadmium plated to prevent corrosion. Two spring rates available to give full valve travel in 5 or 10 lbs. pressure change in top.
5. **Adjusting Screw**—Ball bearing, non-rising type. Is easily accessible. Has 180° turning radius—wide range of adjustment.
6. **Valve Stem**—Polished stainless steel.
7. **Packing Gland**—Easily accessible, specially formed packing with metallic jacket for long life and low hysteresis.
8. **Valve Stem Lubricator**—Ball check type—lubricants for various conditions.

VALVES—Sizes: ½" thru 8". For line pressures up to 250 lbs. per square inch. Rugged construction to withstand piping strains.

VARIETY OF VALVE BODIES

Single seat or double seat, bronze and stainless steel trim. Double unions and flanged ends. Available normally open (direct acting) or normally closed (reverse acting) and 3-way mixing type valves.

POWERS

OVER 55 YEARS OF PNEUMATIC TEMPERATURE CONTROL—OFFICES IN OVER 50 CITIES

Complete Line of Controls for Heating and Air Conditioning Systems

AND EXTRA YEARS OF DEPENDABLE SERVICE

POWERS

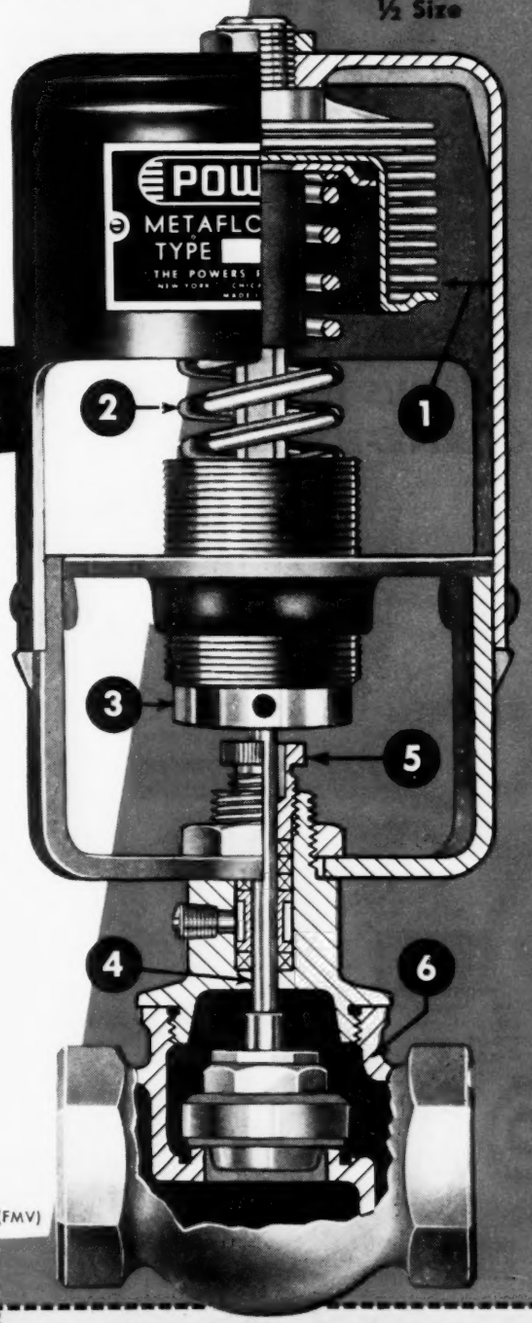
F and FM AIR OPERATED CONTROL VALVES!

The Powers Regulator Co., pioneer in the development of the first all-pneumatic system of temperature control, now offers a new line of modern valves.

Check their many valuable features which can help you make important savings. Test and compare their superior performance with other valves. You'll find POWERS' valves moderately priced—often give more reliable operation over longer periods of time.

Contact our nearest office for further information or mail coupon below. THE POWERS REGULATOR CO., 2718 Greenview Avenue, Chicago 14, Ill. Offices in over 50 cities. Established in 1891.

Illustration ½ Size



(FMV)

Powers *Metaflow* Valves are small, sturdy, lightweight, reasonably priced, suitable for many control applications where space is limited and the pressure differential does not exceed 75 lbs. per square inch.

POWERS METAFLOW VALVE

SPECIFICATIONS

1. **Housing and Bellows**—Two sizes, ½ and 8" with specially formed brass bellows.

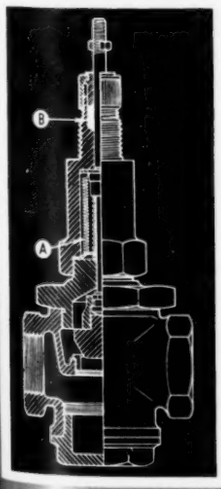
2. **Spring**—Cadmium plated. Calibrated to give full valve travel with 5 lbs. air pressure change.

3. **Adjusting Screw**—Brass, easily accessible. Has 15 lbs. adjustment range to give proper sequence operation where required.

4. **Stem**—Polished stainless steel.

5. **Packing Gland**—Specially formed packing with metallic jacket, grease sealed for long life and low hysteresis. Stem lubricator and variety of lubricants available as optional feature.

6. **VALVES—Sizes:** ½" thru 2"; bronze bodies with screwed ends, maximum body pressure 125 lbs., rugged construction to withstand piping strains. **TRIM**—Composition disc with brass integral seat and self-aligning disc holder. Available normally open (direct acting) or normally closed (reverse acting), and three way.



METAFLOW PACKLESS VALVES

Prevent leakage of dangerous inflammable or harmful liquids or gases . . . . prevent waste and provide vacuum protection. Are suitable for use with Freon, oil, gasoline, non-corrosive gases, hot or cold water and low pressure steam. Have many uses in chemical plants, oil refineries, power plants, submarines and surface vessels.

Specifications: Direct acting valves (normally open); 125 lb. brass bodies, sizes ½", ¾", 1", 1¼"; stainless steel seats and poppets; stem seal (A) is made of specially formed flexible brass bellows. Auxiliary packing gland (B) provides additional safeguard.

Water Heaters, and Industrial Processes

THE POWERS REGULATOR CO., 2718 Greenview, Chicago 14, Ill.

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☐ FLOWRITE VALVE ☐ METAFLOW VALVE ☐ Packless Type

☐ Control Instrument for _____
(Process or Operation)

Name _____ Title _____

Address _____

City _____ State _____

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SMALL STEEL LIFT CHECKS WITH BETTER FLOW

Looking for small steel lift checks that don't chatter, and have extremely low pressure drop? Then specify these Crane 600-Pound Forged Steel Lift Checks. They have a patented cap-sleeve construction that provides high disc lift, even at low velocities, thereby eliminating destructive pounding and chattering. Special design of body contours and port openings give unusually low pressure drop.

Seats and discs are of wear-resisting Crane Exelloy. Rugged, forged steel bodies will withstand severe, high pressure services.

You can get these checks with union caps, screwed or socket welding ends, sizes ¼ through ¾ inches. Or with bolted cap, screwed, socket welding, or flanged ends, in sizes ½ through 2 inches. See your No. 49 Crane Catalog, pages 248-249.

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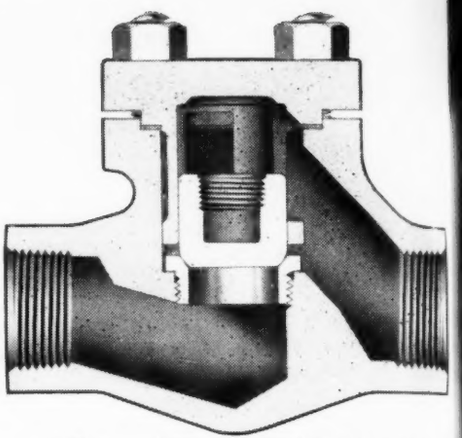
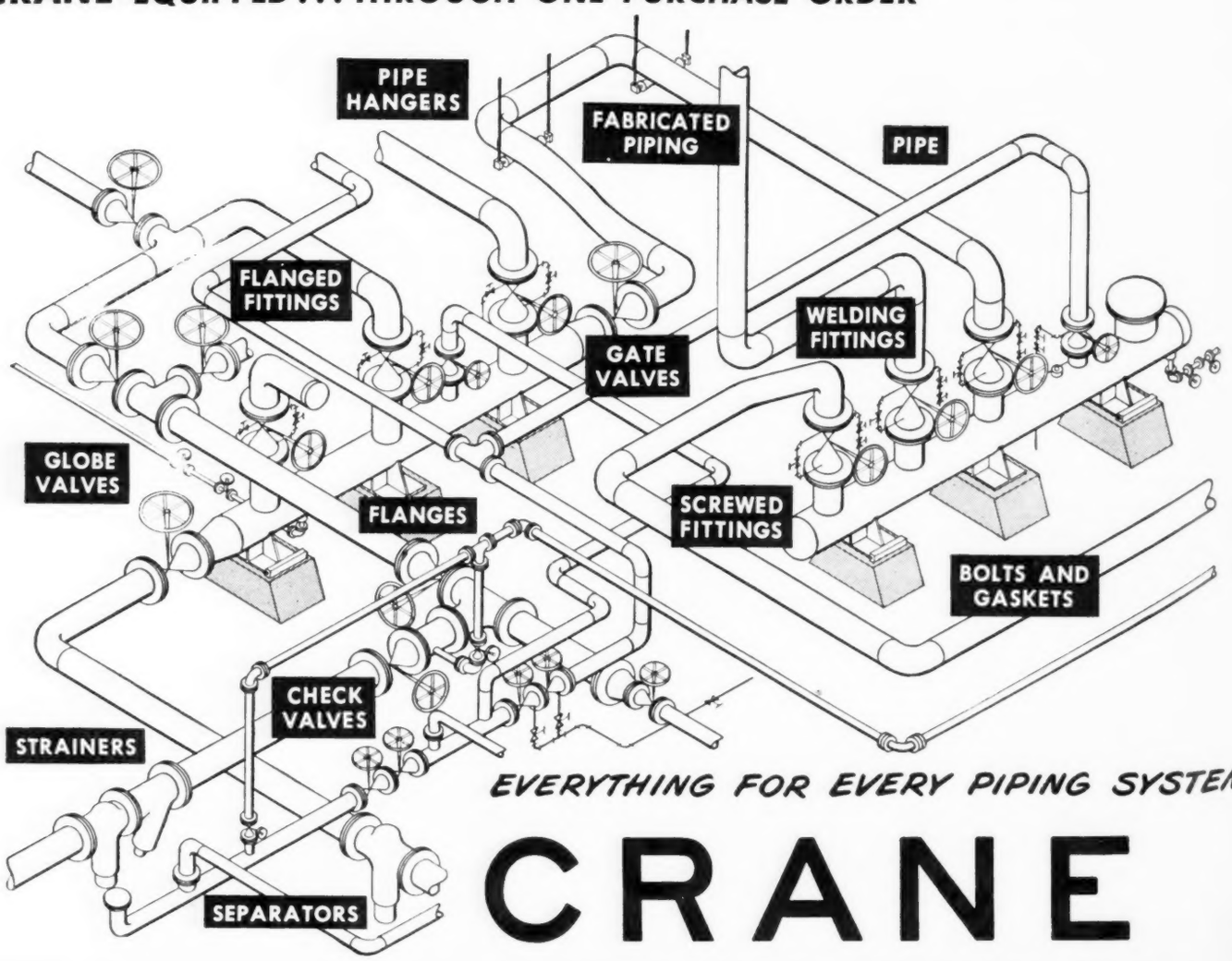


600-Pound Forged Steel Horizontal Check with Bolted Cap. For steam, water, air, and gas up to 850° F.; for oil or oil vapor up to 1000° F. Sizes: ½ to 2-in. Screwed, flanged, or welding ends.

● THIS HIGH PRESSURE STEAM SYSTEM CAN BE 100% CRANE-EQUIPPED ... THROUGH ONE PURCHASE ORDER



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AMERICAN-Standard

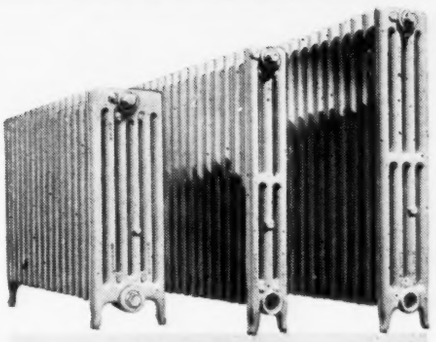
First in heating . . . first in plumbing

Quality Radiators

For Every Type and Size of Job!

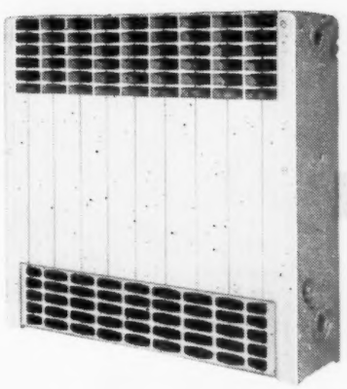
ONE of the most important advantages in handling American-Standard Heating Equipment is that *it is a complete line*—including boilers for all fuels and, in addition, giving you the widest range of radiators. So when a prospective client says he's interested in one, you have an opportunity to install both. And, by so doing, you put yourself in better position to promise him *complete heating satisfaction!*

American-Standard radiators and convectors, in styles and sizes for every type of installation, are sold through selected Wholesale Distributors to Heating and Plumbing Contractors. **American Radiator & Standard Sanitary Corporation,** P. O. Box 1226, Pittsburgh 30, Pennsylvania.



ARCO Radiators

The thin-tubed radiator that does a big heating job. Slender, modern, graceful, they deliver as much heat as old-style radiators 1/3 larger. Made in 4 widths and several heights to meet all needs.

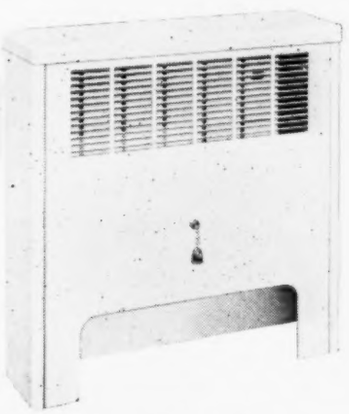


SUNRAD Radiator

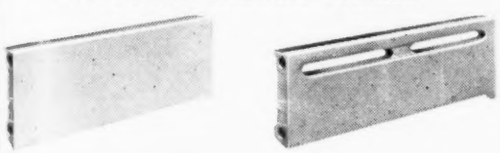
Made of durable cast iron. Provides both radiant and convected heat. Its smart, simple lines make it an ideal unit for all types of residential or commercial buildings. Can be installed recessed, semi-recessed or free-standing.

ARCO Multifin Convector (stock model)

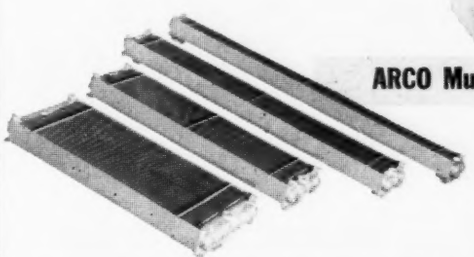
Consisting of the famous Arco Multifin Convector in combination with the smartly-styled NFS Enclosure, these stock models are completely assembled in one package as a single, compact unit. Available in sizes for which there is the greatest demand—in heights of 20, 24 and 32 inches; and in widths 6¼, 8¼ and 11½ inches and in ten lengths—from 21⅛ to 65⅛ inches.



BASEBOARD RADIANT PANELS



Installed at the floor line, replacing ordinary baseboards, they take up little more than an inch of floor space when recessed. Made of cast iron, panels come in two types as illustrated above. Type R, at left, provides radiant heat alone. Type RC combines both radiant and convected heat for use where heating requirements are above average. Can be used with forced hot water or two-pipe steam system.

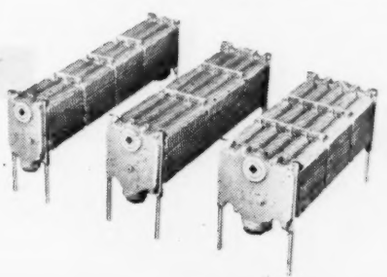


ARCO Multifin Convectors

Made for all systems except one-pipe steam. Convector elements have ¾" diameter seamless copper tubes, correctly spaced nonferrous fins, cast iron headers and protective steel side plates.

ARCO Cast Iron Convectors

Scientifically engineered and rated by the American-Standard Institute of Heating Research, Arco Cast Iron Convectors provide a continuous flow of warmed air, resulting in quick and economical heating. May be installed in attractive American Enclosures.



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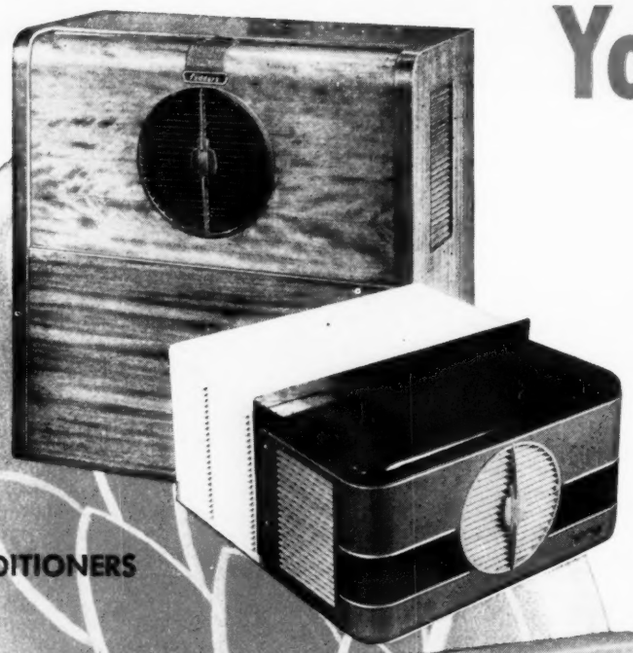

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Did you know that the Fedders Heating D
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Did you know that in addition to a consta
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Did you know that Fedders is one of the lar
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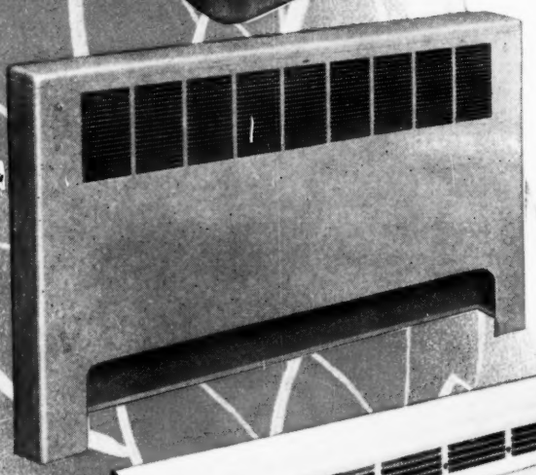
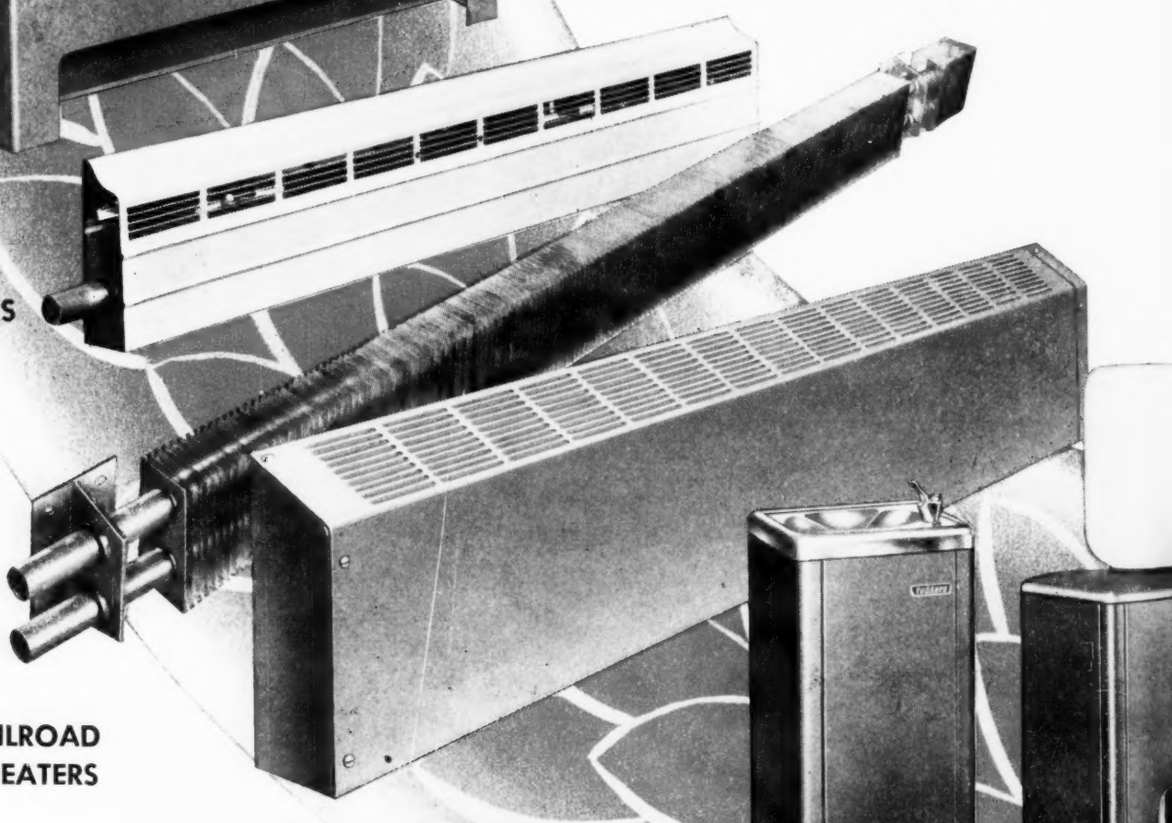


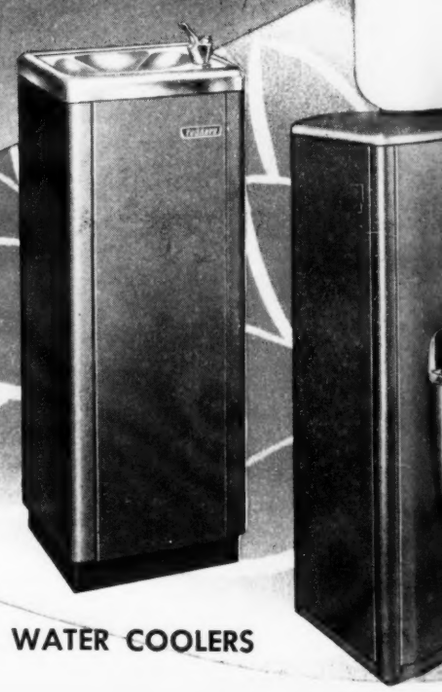
CONVECTOR
RADIATORS



BASEBOARD
RADIATORS

RAILROAD
CAR HEATERS

WALL RADIATION



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EDDERS Heat Transfer Experience

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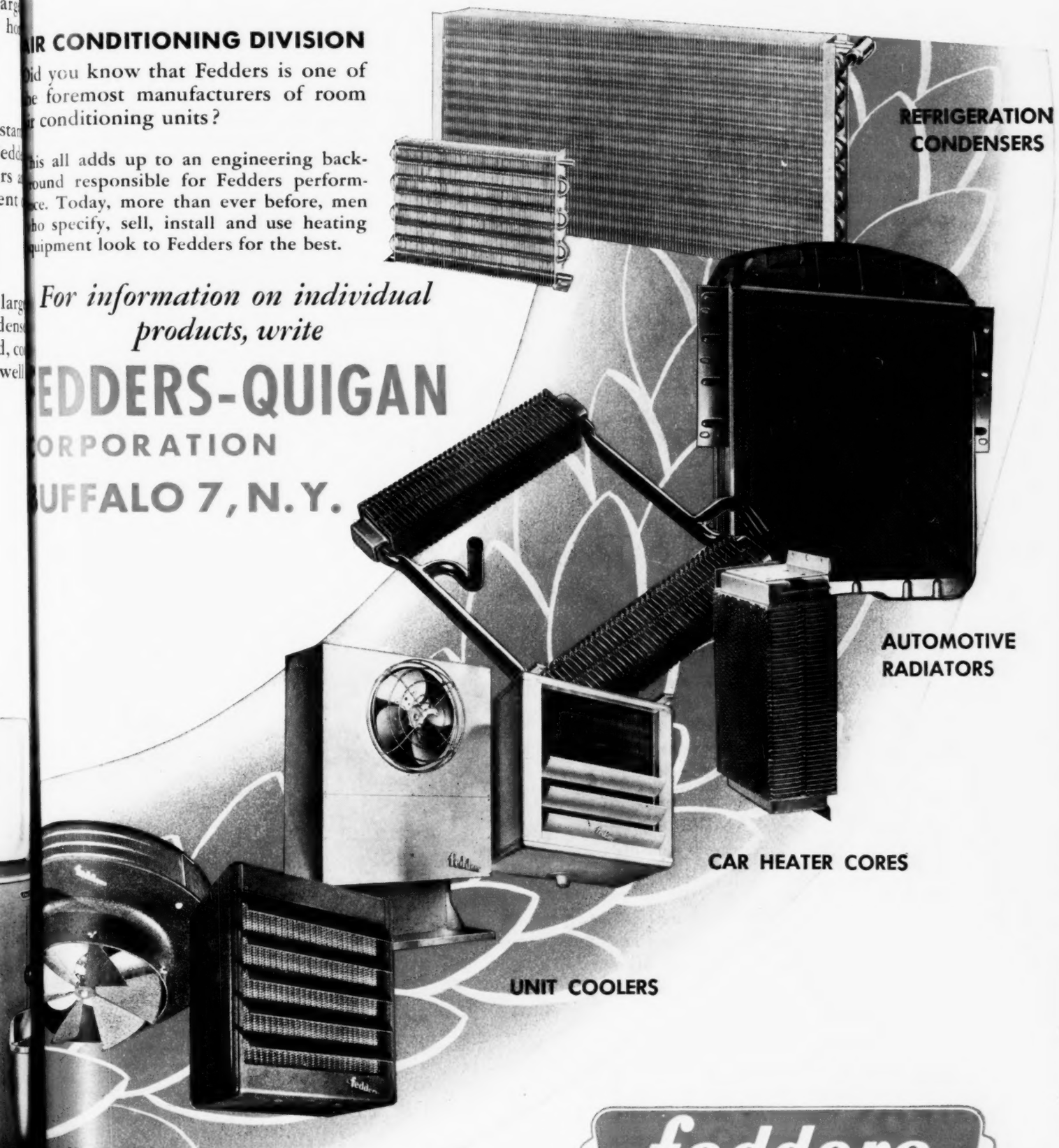

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In conference rooms, offices, corridors . . . in fact, throughout the United Nations Secretariat Building the new square Anemostat Type E Air Diffusers provide stimulating, draftless comfort.

These new square Anemostat Air Diffusers offer *for the first time* . . . uniform circular air diffusion from a square outlet plus effective aspiration. This aspiration effect, the drawing of room air *into* the diffuser and mixing this room air with supply air *within* the outlet, is *the* important reason why Anemostats do a completely satisfactory job of eliminating annoying drafts and stale air pockets, equalizing temperature and humidity throughout the entire conditioned area.

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Anemostat Type E Air Diffusers fit without modification into the framework that holds standard size acoustic tile. At a "twist of the wrist," the inner assembly can be quickly removed for cleaning.

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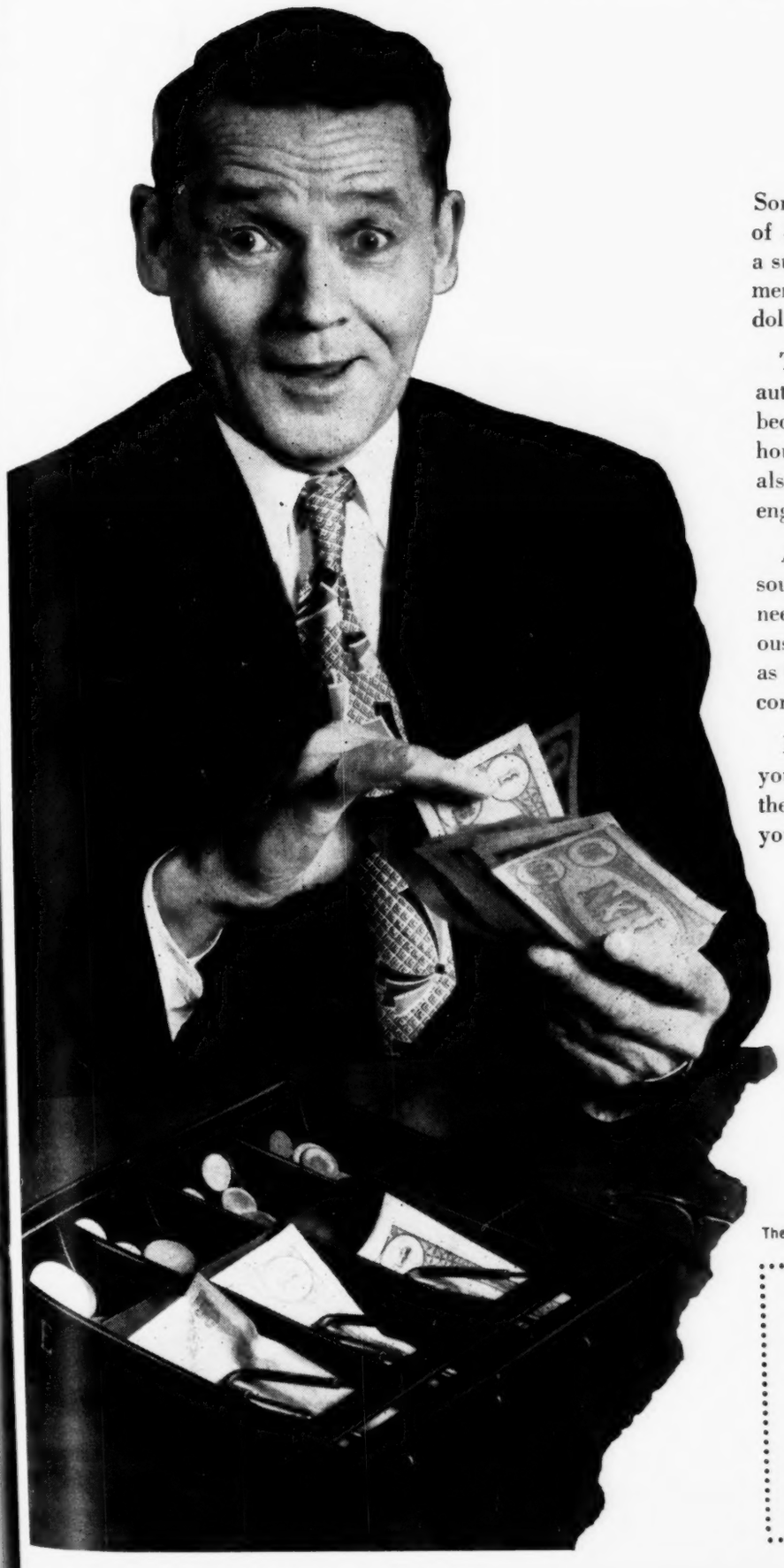
BULLETIN 29A

Gives the complete story on the new Anemostat Types E and E-1 Air Diffusers. Write for your copy.

So there's a different way to count profits?



Some say that profit depends on the number of dollars that flow into the till. But there's a surer way to count profits on heating equipment. It's simply knowing how many of those dollars *stay* in the till!

Take the contractor who installs Bryant automatic gas heating. He keeps more dollars because Bryant equipment requires fewer man hours for installation, fewer service calls. He also has Bryant experts to help him on his engineering problems.

Again, he saves because Bryant is a single source for most of his heating equipment needs. No endless contacts, no reams of various orders. Boilers and unit heaters, as well as furnaces, conditioners and water heaters, all come from a nearby Bryant warehouse.

No question about it, Bryant is the line if you look carefully at the profit picture. And the coupon below is a handy way to say you're interested.

Let the pup be furnace man
... and water boy, too!

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AUTOMATIC HEATING

The most complete line of gas heating equipment in the nation

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( ) Send me the new booklet that tells the Bryant story. ( ) Have your distributor call on me.

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Little wonder — considering how comfortable Carrier air conditioning keeps them. In sixteen of New Orleans' most important buildings, Carrier Centrifugal Refrigerating Machines furnish refrigeration for air conditioning.

Carrier Centrifugals are compact and light in weight. They are virtually vibrationless. In a city built on piling with almost no basement space, these advantages are of primary importance.

Your next project may have other requirements. Whatever they are, we are sure that Carrier equipment and Carrier experience can fill them with credit to you. You'll find a local Carrier office in the classified telephone directory. Carrier Corporation, Syracuse, New York.

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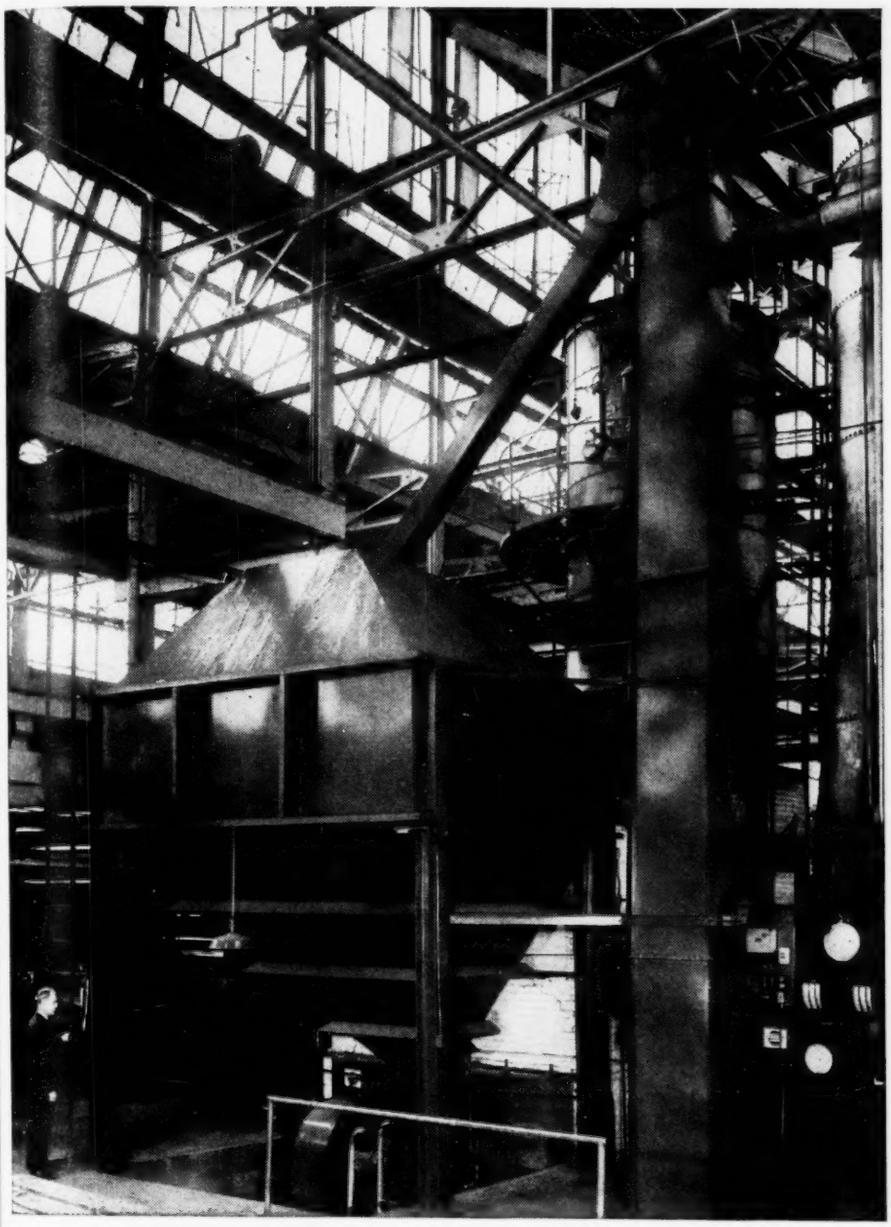
New Orleans Public Service • Orpheum Theatre • Roosevelt Hotel • St. Charles Hotel • Sears, Roebuck & Co. • Whitney Bank Building



A single large Vulcan Ramfeed Stoker fires this 450 H. P. Wickes Vertical Waste Heat Type Boiler — automatically maintaining heat over week-end shutdowns with no attention.

"We switched from oil and gas to Canton Stoker fired coal and saved 2/3 of our former fuel cost"

... says the well satisfied plant manager of Babcock Printing Press Corporation, Canton, Ohio

Building the gigantic, modern Babcock Rotary Printing Presses that print a whole magazine in four colors requires a huge high ceilinged plant, plus uniform temperatures for proper fitting of precision parts.

Both oil and gas were tried, but the cost proved excessive ... temperatures varied too much for precision work. CANTON'S Engineers were then called in on the problem, and a complete stoker and coal handling system were installed on their recommendations. In the *first* heating season, the installation saved considerably more than its cost, *returning a substantial profit on the investment* and paying added dividends in improved working conditions.

Consult a Canton Field Sales Engineer (in principal cities) and find out how CANTON STOKERS can help you with your heating or power problem. No cost or obligation is involved. Or write or wire direct to CANTON STOKER CORP., 407 Andrew Place S. W., Canton, Ohio.

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SAFE
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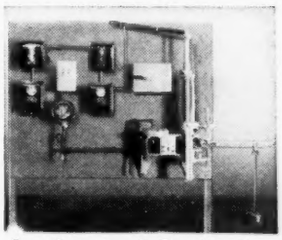
LOWEST COST

"Turbo-Aire" Jets—for smoke abatement, firing efficiency.



Synchronized Combustion Control Systems—for all boilers.

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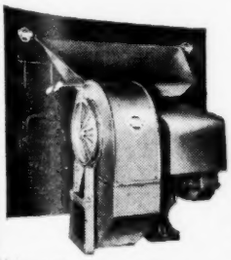
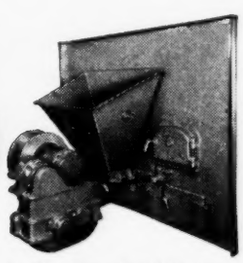
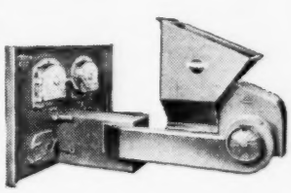


Vulcan Ramfeed Stokers —for loads up to 800 H. P.



LoSet Ramfeed Stokers —for loads up to 350 H. P.



Duraflex Wormfeed Stokers—for loads up to 175 H. P.

Gentlemen:

___Please send all descriptive literature at once

___Have a CANTON Engineer interview us immediately

Name _____

Company _____

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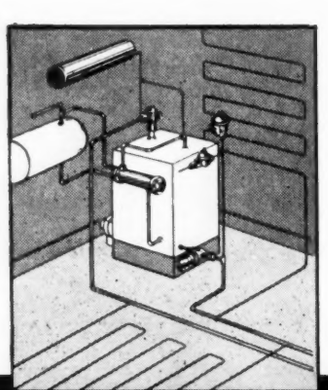
Leading name in RADIANT HEAT

LOW COST HOT WATER CONTROLS

THRUSH Radiant Hot Water Heat is a leader . . . in economy, in efficiency, in popularity. Thrush Flow Control System offers the simplest yet most satisfactory method of automatically controlling temperature of radiant ceiling, wall or floor panels. This system provides uniform heating comfort without continuous Circulator operation. Inexpensive No. 201 Thrush Radiant Heat Control, illustrated below, maintains a constant room temperature and system water temperature without variation. Thrush Forced Circulating Flow Control System is easy to install. It provides economical heating plus summer as well as winter supply of domestic hot water for laundry, bath and kitchen use.



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Send for booklet giving the complete story of Thrush Radiant Hot Water Heat. The same simple equipment may be used for zoning apartments inexpensively and is ideal for modernizing home heating plants. Ask your wholesaler about it or write Dept. D-6.

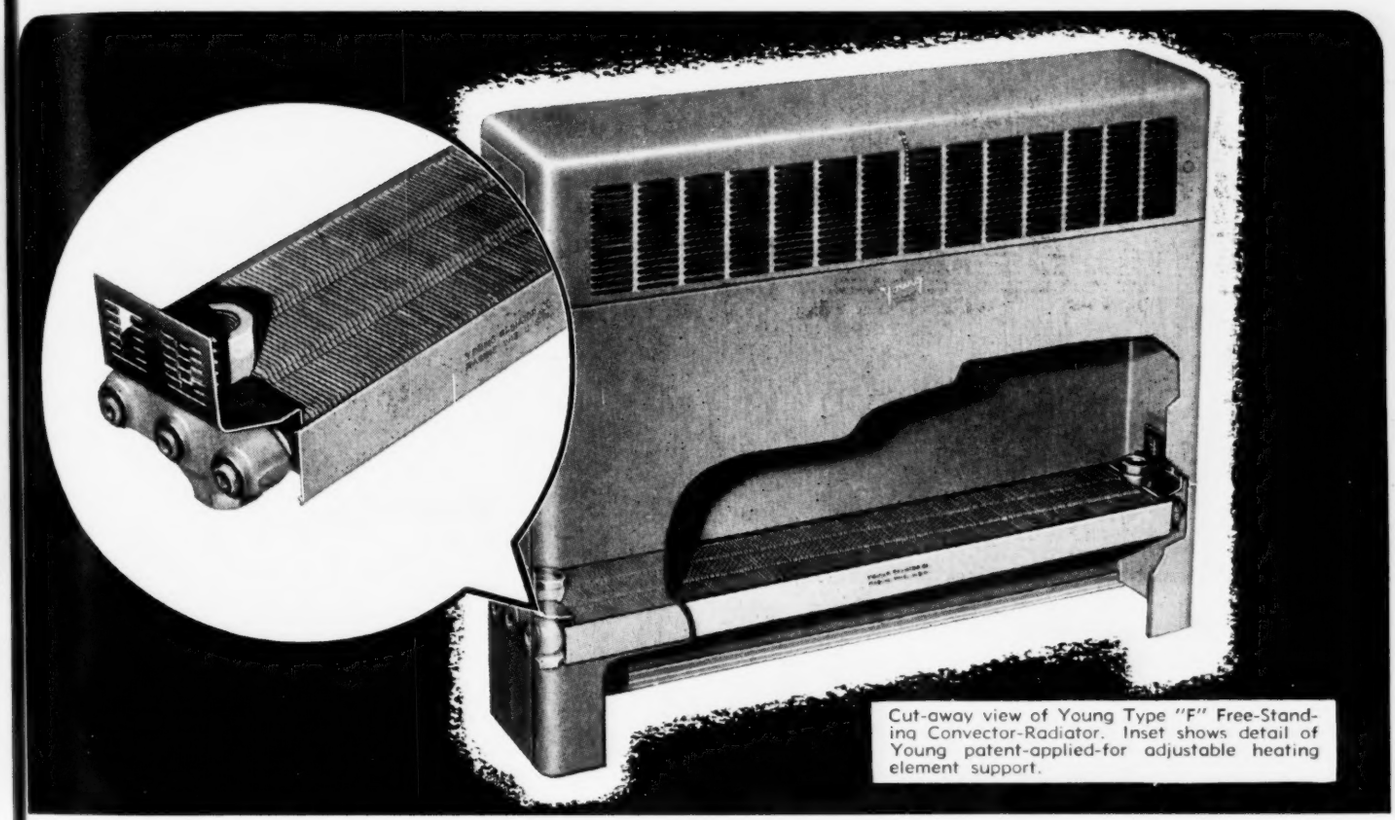
FLOW CONTROL VALVE WITH AIR TUBE

WATER CIRCULATOR

NO. 201 RADIANT HEAT CONTROL

H. A. THRUSH & COMPANY · PERU, INDIANA

Save on Installation Costs with YOUNG CONVECTOR-RADIATORS



Cut-away view of Young Type "F" Free-Standing Convector-Radiator. Inset shows detail of Young patent-applied-for adjustable heating element support.

Once again Young Engineering saves you money. A new heating element support cuts installation time and permits quick pitching adjustments. Its rigidity permits shipping core in position . . . another time saver. An additional Young innovation, unit packaging, also speeds handling on the job. Each sturdy carton is clearly marked for quick identification and protects units in handling. The Young Convector-Radiator Line includes a style and size for any hot water and two-pipe steam system. Mail the coupon below for further helpful information.

YOUNG

Heat Transfer Products for Automotive and Industrial Applications.

Young Quality

T. M. Reg. U.S. Pat. Off.

Heating, Cooling, and Air Conditioning Products for Home and Industry.

YOUNG RADIATOR COMPANY

DEPT. 520-F, RACINE, WISCONSIN

Plants at Racine, Wisconsin and Mattoon, Illinois
Sales and Engineering Offices in All Principal Cities

LEARN HOW YOUNG CONVECTOR-RADIATORS CAN CUT CORNERS ON HEATING BUDGETS

YOUNG RADIATOR COMPANY
Dept. 520-F
Racine, Wisconsin

Rush me full details about the Young Convector-Radiator Line, without obligation.

Name_____

Address_____

City_____ Zone_____ State_____

Budd chooses Air-Maze filters for new rail diesel car!

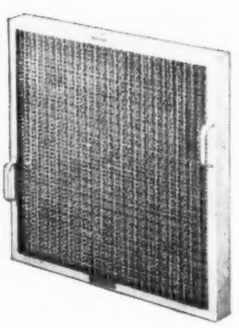
FOR extra passenger comfort, Air-Maze filters in the ventilating system of Budd's new RDC's keep the air clean and free from dust and lint.

Air-Maze special railroad filters are of rugged, all-metal construction and provide the extra dust holding capacity so essential to heavy duty service. Because they hold more dust, the frequency of servicing is cut. And when cleaning is necessary, it's quick and easy.

For twenty-five years, Air-Maze filters have been proving themselves in all types of transportation and industrial applications. The filters used in the Budd RDC's are only two of many types of special Air-Maze railroad filters which are widely accepted in passenger car, diesel engine and diesel cab applications. For help in your air filter problem, contact your nearby Air-Maze representative or write the Air-Maze Corporation, 5200 Harvard Avenue, Cleveland 5, Ohio.

TYPE P-18
FOR FRESH AIR INTAKE

A special 4"-thick filter. All metal, low resistance. Holds more dirt than other designs. Requires less servicing.



TYPE B
FOR RECIRCULATED AIR

Progressively graduated density of the media (galvanized steel wire cloth) permits collection of lint and other fibrous material with low pressure drop rise.

AIR FILTERS
SILENCERS
SPARK ARRESTERS

AIR-MAZE
THE FILTER ENGINEERS

LIQUID FILTERS
OIL SEPARATORS
GREASE FILTERS

LARGE RESIDENCE DESIGNED BY MARCEL BREUER—RADIANT HEATED with CHASE COPPER TUBE!

HERE'S WHY
you too will want Chase Copper Tube in your Radiant Heating Installations!

EASY TO BEND • LONG LIFE • LONG LENGTHS
SOLDERED FITTINGS • LOW COST • LIGHT IN WEIGHT
SMALL DIAMETERS

Residence in Ligonier, Penna., *is heated by coils using 6000 feet of 1" Chase Copper Tube. Outdoor piping and water supply lines use 1500 feet in sizes from ½" to 2". Architect: Marcel Breuer, New York City. Engineer: Benjamin L. Spivak, New York City. Plumbing and heating contractor: John Hall, Ligonier, Penna.*

FROM the finest of residences to economical basementless houses, there's a growing trend to radiant heating—*with Chase Copper Tube.*

Chase Copper Tube in coils, soft temper, is easily bent without special tools. It comes in 60 and 100 foot lengths—the number of connections is cut to a minimum. The joints are made easily and quickly with solder-joint fittings.

Its light weight and small diameters make it just as easily adaptable to ceiling installation as it is to concrete floor slab construction. Its high resistance to corrosion means long service life.

And it's available for immediate delivery!

Chase Brass & Copper Co., Dept. HV650
Waterbury 20, Conn.

Gentlemen: *Please forward your book, "Suggestions for Designing Radiant Panel Heating with Copper Tube."*

Firm_____

Name_____ Title_____

Street_____

City_____ State_____

SEND FOR FREE BOOK! "Suggestions for Designing RADIANT PANEL HEATING with Copper Tube."

Chase

the Nation's Headquarters for
BRASS & COPPER

WATERBURY 20 CONNECTICUT — SUBSIDIARY OF KENNECOTT COPPER CORPORATION

THIS IS THE CHASE NETWORK . . . *handiest way to buy brass*

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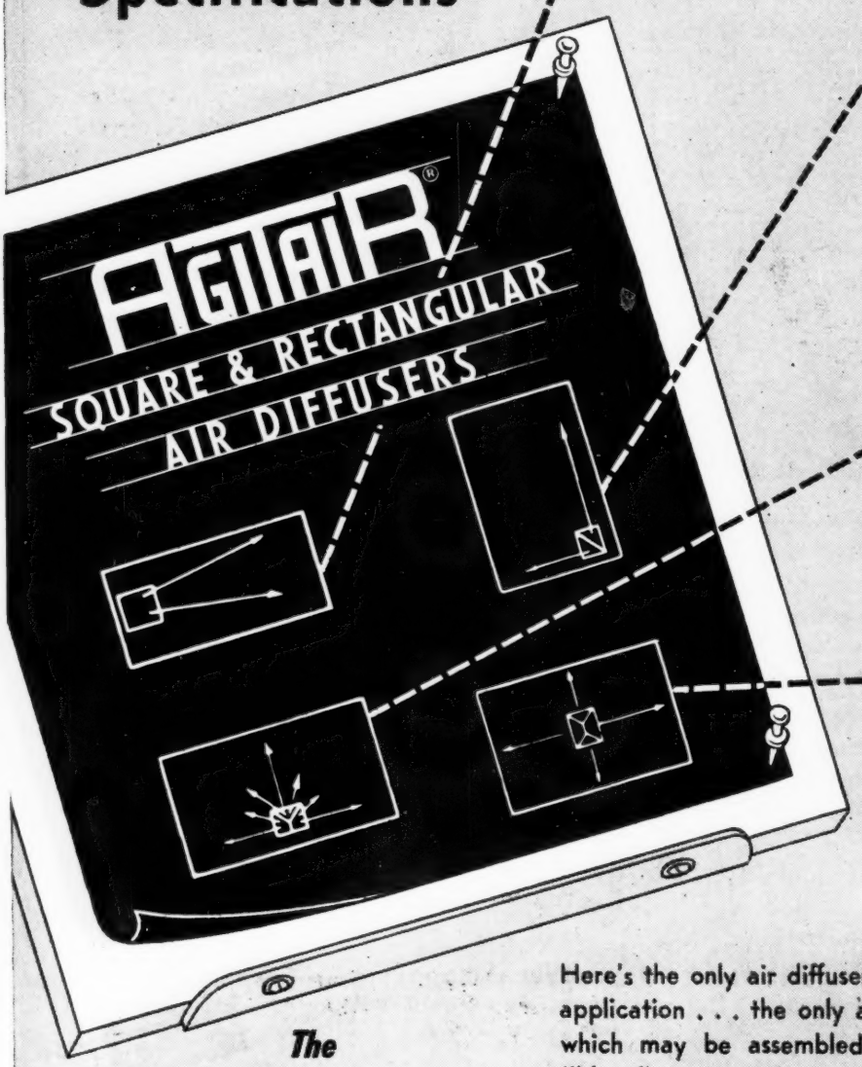
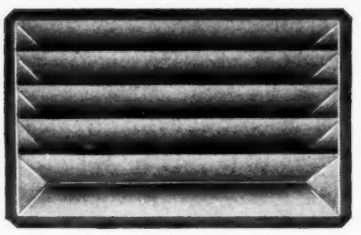
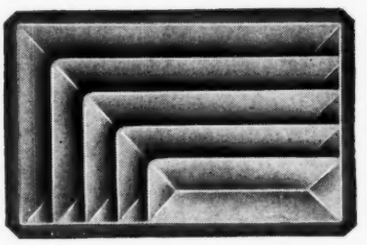
Air Diffusers *Tailor-Made* To Your Specifications

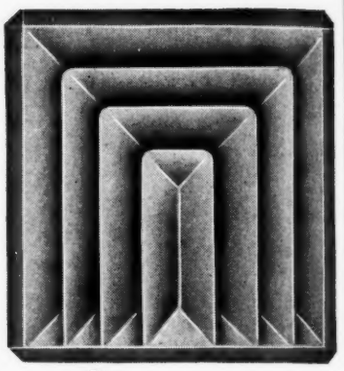




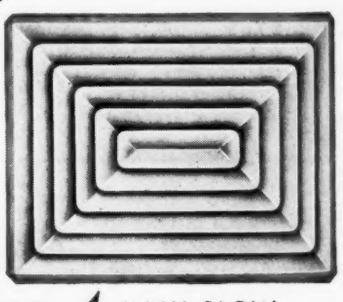
1 WAY BLOW



2 WAY BLOW



3 WAY BLOW



4 WAY BLOW

The Diffusing Vanes Make the Difference!

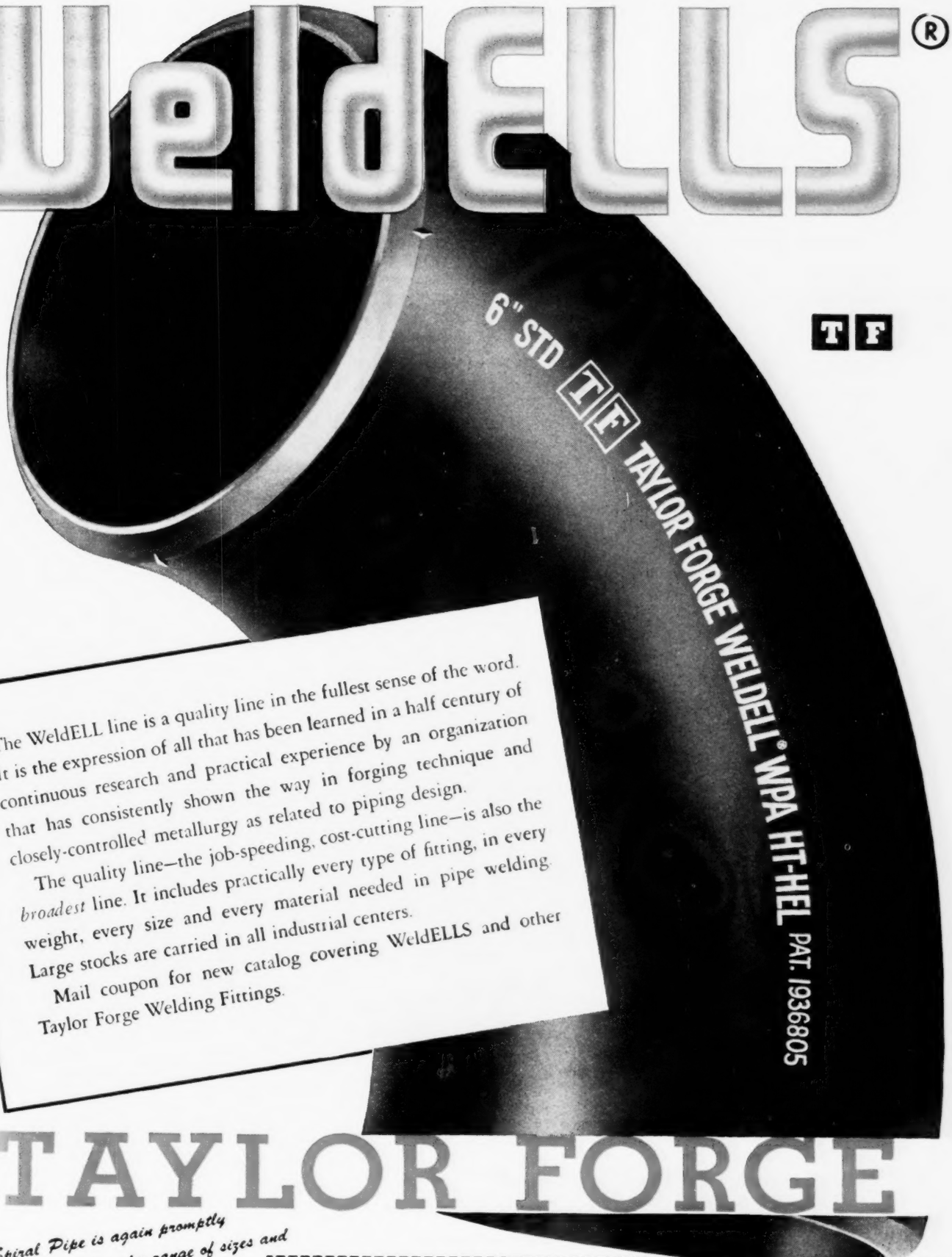
Here's the only air diffuser tailor-made to suit conditions of each application . . . the only air outlet with patented diffusing vanes which may be assembled in a variety of patterns to provide "blows" in one - two - three - and four directions. That's why Agitair assures 100% air distribution in any shape area, from any location, without makeshift blank-off's or oversized outlets. Discover the many exclusive Agitair advantages.

Write For Complete Data

AIR DEVICES, Inc. **17 East 42nd St. • New York 17, N. Y.**

Air Diffusers • Air Filters • Roof Exhausters

WeldELLS®



The WeldELL line is a quality line in the fullest sense of the word. It is the expression of all that has been learned in a half century of continuous research and practical experience by an organization that has consistently shown the way in forging technique and closely-controlled metallurgy as related to piping design.

The quality line—the job-speeding, cost-cutting line—is also the *broadest* line. It includes practically every type of fitting, in every weight, every size and every material needed in pipe welding. Large stocks are carried in all industrial centers.

Mail coupon for new catalog covering WeldELLS and other Taylor Forge Welding Fittings.

TAYLOR FORGE

Taylor Spiral Pipe is again promptly available in a broader range of sizes and thicknesses. Coupon brings pipe bulletin.

TAYLOR FORGE & PIPE WORKS
P. O. Box 485, Chicago 90, Illinois
Offices in all principal cities: *Eastern Plant:* Carnegie, Pa. *Western Plant:* Fontana, Calif.

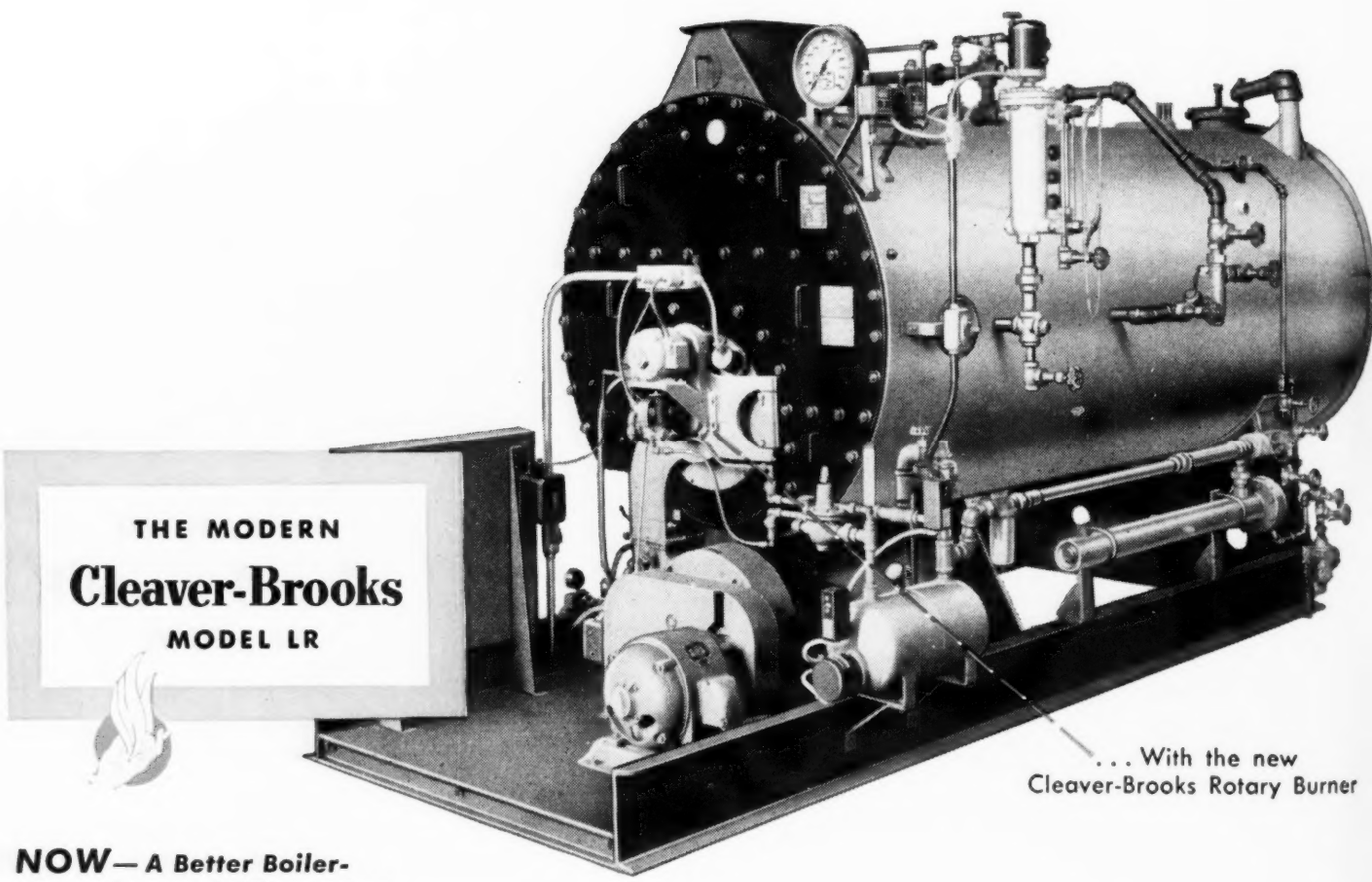
☐ Please send new Catalog 484 covering welding fittings and forged steel flanges.
☐ Send new Bulletin 493 covering Taylor Spiral Pipe and related fittings.

NAME_____
POSITION_____
COMPANY_____
STREET ADDRESS_____
CITY_____ ZONE_____ STATE_____

511-0650 Mail to Taylor Forge & Pipe Works, P. O. Box 485, Chicago 90, Ill.

Design

FOR PRODUCING STEAM



. . . With the new
Cleaver-Brooks Rotary Burner

NOW— A Better Boiler-Burner Unit to Utilize Today's Low-Cost Fuels — Heavy Oil and Gas

The Cleaver-Brooks Model LR is a "trail-blazer" in modern self-contained boiler design and construction. It makes more effective use of today's low-cost fuels, (heavy oils and gas), and you are assured of better boiler performance.

A Brief List of Notable Features:

— the new Cleaver-Brooks rotary burner — simple — compact — precision machined — perfect mechanical balance — fully automatic — provides unprecedented flexibility in burning heavy fuel oils or industrial gases.

— single low-speed, low-power consumption blower furnishes both primary and secondary air for combustion—less weight and space requirements — reduction in sound levels.

— totally enclosed, drip and dust-proof panel for all major electrical controls.

— electronic combustion safety devices, dual low water cutoffs — are standard equipment.

— simplified design of combination gas-oil burner permits change-over from oil to gas or vice versa in less than a minute.

— improved design of boiler furnace and liberal heating surfaces provide greatest economy with all fuels.

— boilers of all-welded construction — meet standards of A.S.M.E. boiler code and leading underwriters — burner approved by recognized national agencies.

The Cleaver-Brooks Model LR self-contained boilers are of a highly developed four-pass fire tube design — tested and proved by factory and field experience on several thousand boilers of this type.

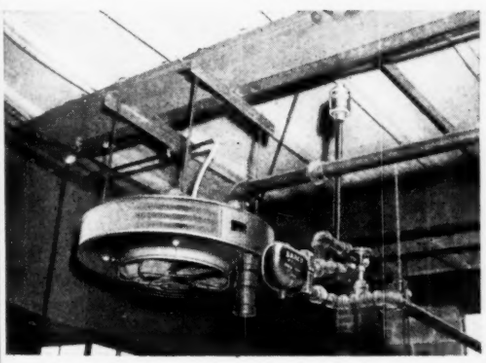
Write for complete specifications, dimension data, firing rates.

CLEAVER-BROOKS
COMPANY
366 EAST KEEFE AVENUE
MILWAUKEE 12, WISCONSIN

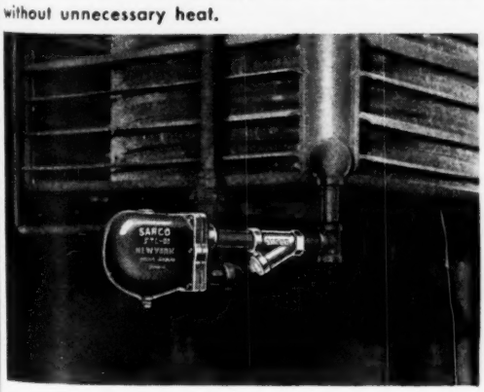
Now Ready: Bulletin SG 142 contains detailed data and description of the MODEL LR. Send for your copy today!

ARE YOUR HEATERS

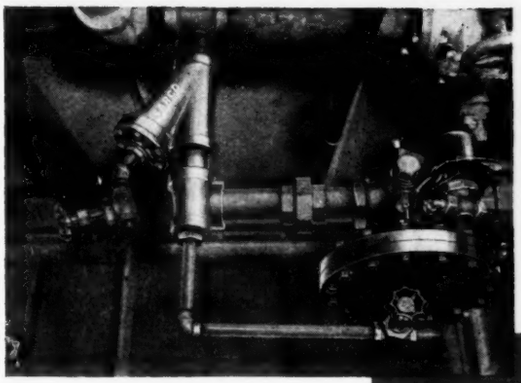
Getting a Break?

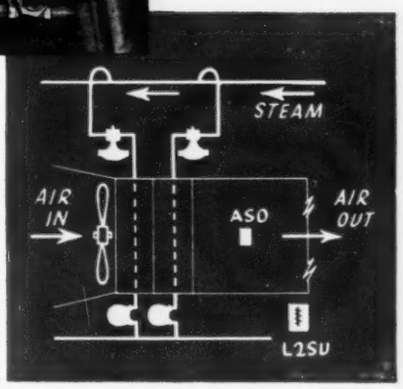


At Broadvue Motors, Cleveland, Ohio—large doors let in cold at irregular intervals. Here Sarco Electric Thermostat and Float Trap keep the rooms comfortable without unnecessary heat.



Down blast unit heater dispels mist in dye room. Sarco Float Thermostatic Traps and Sarco Strainer ideal for continuous jobs like this.





Two Sarco DSH 125 Regulators control each of the five large double coil heaters overhead. At times only the one section of each heater is on. Sarco ASO Ductstats shut off the coils in case of overheating. Result —Good working conditions with lowest fuel costs.

No matter how carefully you select and locate the unit heaters to fit the job to be done, complete satisfaction cannot be assured unless you also take care of the vital factors:

1. Use the right steam trap and air vent to keep the heater surfaces in contact with hot, dry steam, and remove condensate and air rapidly and completely.

2. Provide simple but effective Sarco Controls to start and stop the fans as required, or to modulate the steam supply to the heaters.

At the left—two simple examples of unit heater efficiency. You can get 10 to 30% more out of your heaters by spending 1 or 2% of their cost for suitable Sarco Steam Traps and Controls. Ask for special information on unit heater hook ups.

OR BETTER YET — ASK THE SARCO MAN NEAR YOU

256

SARCO COMPANY, INC.

Represented in Principal Cities

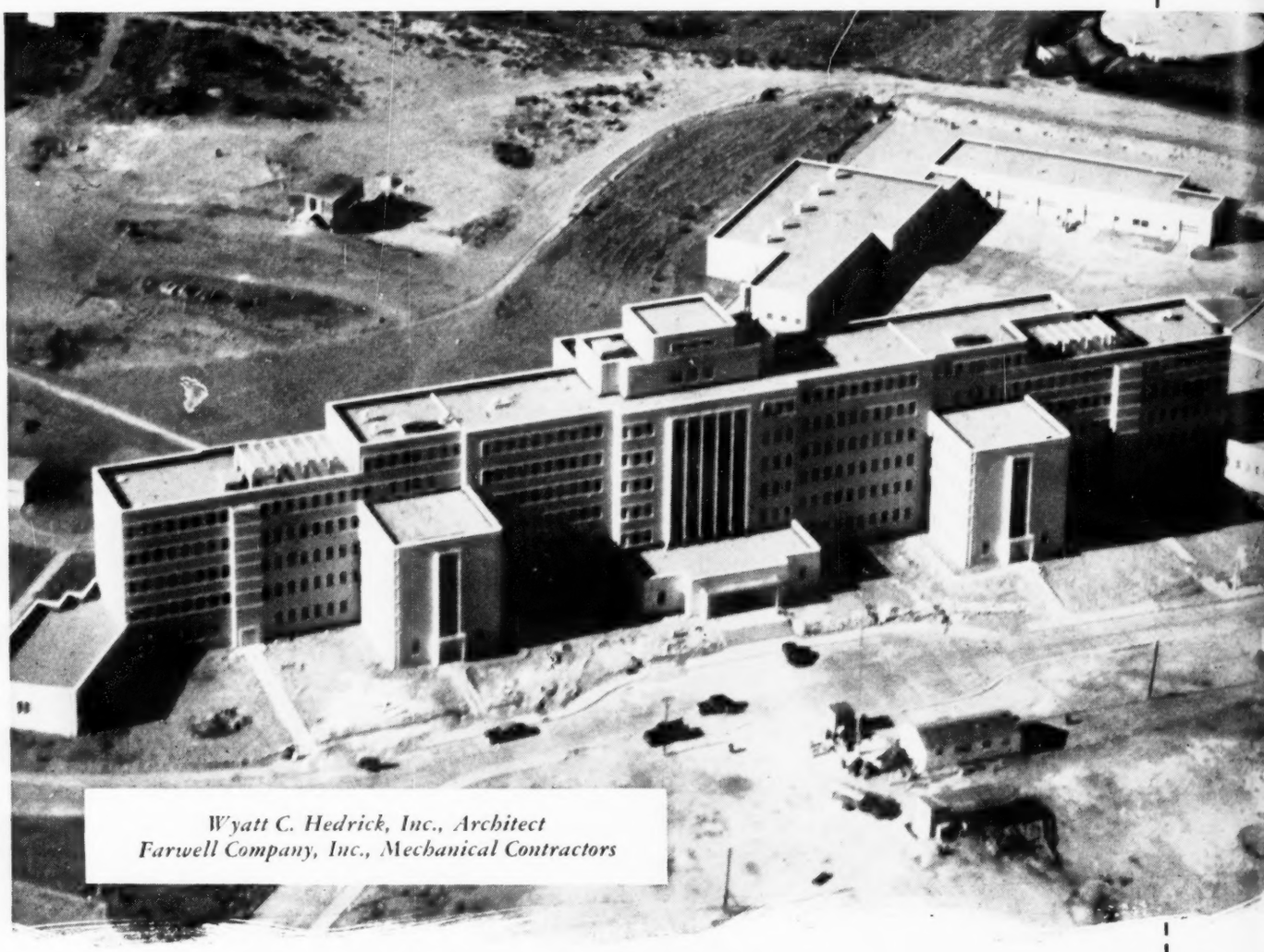
Empire State Building, New York 1, N. Y.

SARCO CANADA, LTD., TORONTO 5, ONTARIO

SARCO SAVES STEAM

IMPROVES PRODUCT QUALITY AND OUTPUT

VETERANS HOSPITAL DECLARES WAR ON DUST AND SOOT



Wyatt C. Hedrick, Inc., Architect
Farwell Company, Inc., Mechanical Contractors

3 types of AAF filters serve new Big Springs, Texas unit

IT'S "No Admittance" for dust and soot at the new Veterans Administration Hospital at Big Springs, Texas. All air conditioning units in this building are serviced by AAF filters. In the operating rooms super-clean air is supplied by Electro-Matic* filters. Kitchen and service areas are served by Multi-Duty filters and the seclusion wards by American Type M/W viscous unit filters.

Here again AAF's complete line of product assures the right filter for each air cleaning requirement—an important factor in keeping performance standards high and costs low. AAF has no stock solution for all air cleaning problems. Its line of filters ranges from the simple low cost throway unit to the high efficiency electronic precipitator. As a result, you can fit the filter to the job rather than the job to the filter.

Clean air is rapidly becoming an important commodity in the minds of business and industry. Your local AAF representative will be glad to assist you in the planning of your customers' air cleaning needs. Write today for his name and complete product information.

AMERICAN AIR FILTER COMPANY, INC.
294 Central Avenue, Louisville 8, Kentucky
In Canada: Darling Bros., Ltd., Montreal, P. Q.

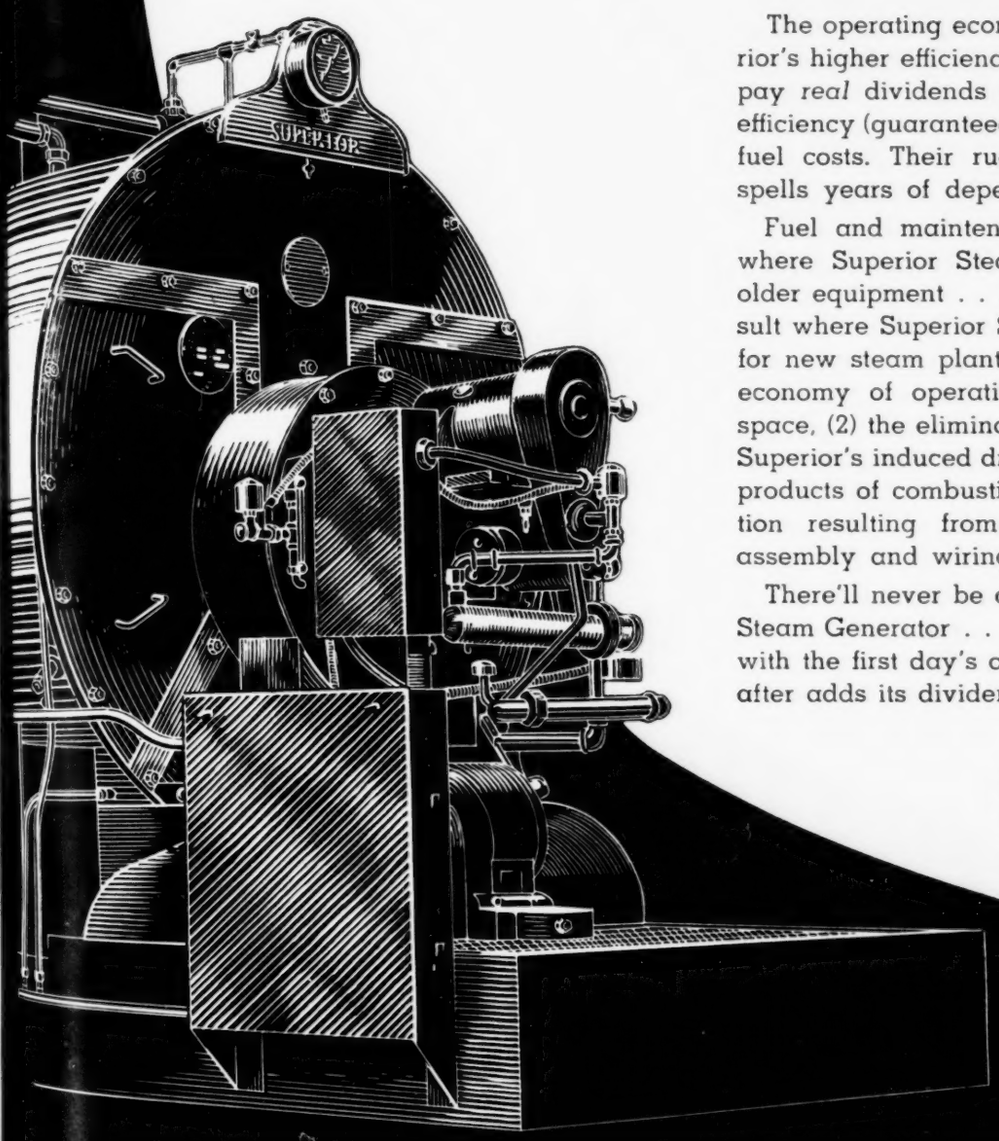
**Automatic Electronic Precipitator*

®AAF

AIR FILTERS
AND ELECTRONIC PRECIPITATORS

For STEAM DIVIDENDS Tomorrow

Buy SUPERIOR STEAM GENERATORS Today



The operating economies which result from Superior's higher efficiency and long-lived dependability pay *real* dividends to their owners. Their thermal efficiency (guaranteed to exceed 80%) insures lowest fuel costs. Their rugged, heavy-duty construction spells years of dependable, trouble-free operation.

Fuel and maintenance savings are outstanding where Superior Steam Generators have replaced older equipment . . . but the greatest dividends result where Superior Steam Generators are specified for new steam plants. For here are added to their economy of operation (1) the economy of small space, (2) the elimination of an expensive stack (for Superior's induced draft requires only a vent for the products of combustion), and (3) simplified installation resulting from Superior's complete factory assembly and wiring.

There'll never be a better time to buy a Superior Steam Generator . . . because these dividends start with the first day's operation, and every day thereafter adds its dividend.

17 sizes from 20 to 500 b.h.p. for pressures up to 250 p.s.i. Fully automatic with all grades of oil or gas. For complete data write for Catalog 219.

Superior Combustion Industries, inc.

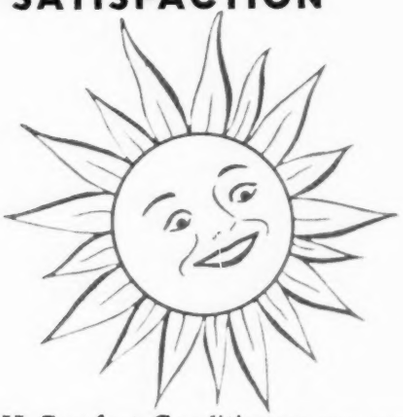
Factory Emmaus, Pa.

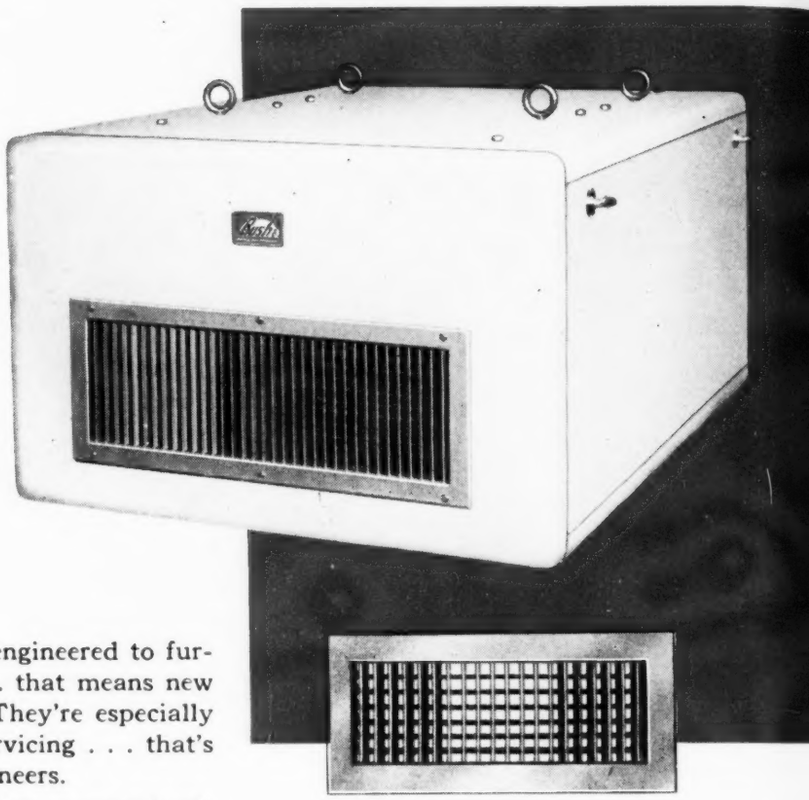
Executive Offices Times Tower, Times Square, New York 18, N. Y.

Be sure to specify

The New Bush Comfort Conditioner

FOR CUSTOMER SATISFACTION



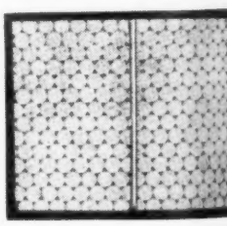


BUSH Comfort Conditioners are expertly engineered to furnish better air conditioning at low cost . . . that means new customers and more profit for the dealer. They're especially designed to afford easy installation and servicing . . . that's good news for contractors and service engineers.

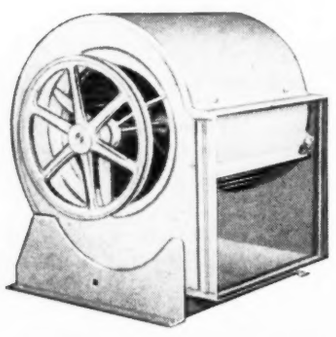
The BUSH Comfort Conditioner is a ceiling-mounted unit . . . conserves valuable floor space. The condensing unit can be placed in the basement or any other location away from the air conditioned area — thereby eliminating noise. If the business location should change, the BUSH Comfort Conditioner can be easily moved: merely unbolt from the ceiling and pack along the condensing unit . . . you can move the air conditioning as you would a piece of furniture.

Investigate the BUSH Comfort Conditioner today; you'll be glad you did.

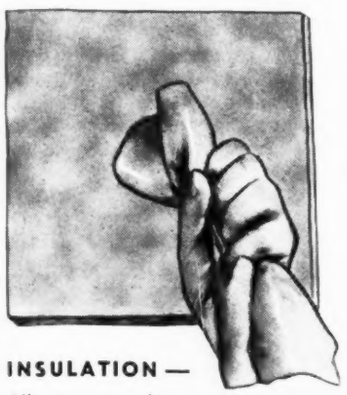
DISCHARGE GRILL — Two-directional discharge grill allows for wide variety of air distribution.



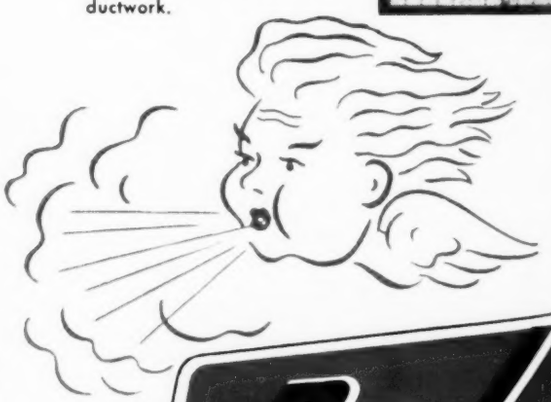
FILTERS — Throw-away type filters are available for all units. All filter sections have a flange for attachment to ductwork.



BLOWER WHEEL AND BEARING ASSEMBLY — Balanced forward-curved wheel and neoprene-encased bearing assembly provide smooth performance and long life.



INSULATION — All cases are insulated with thermal-acoustical material for quiet operation and insurance against condensation on casing.



BUSH MANUFACTURING CO. • WEST HARTFORD 10, CONN.

BUSH HEAT TRANSFER PRODUCTS

Buy the Best-and the Best is Bush

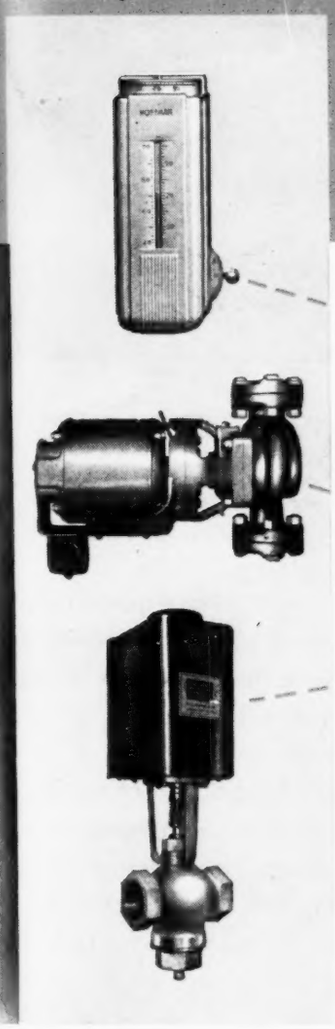
C-141 HOT WATER SYSTEM

Automatic CONTROLS

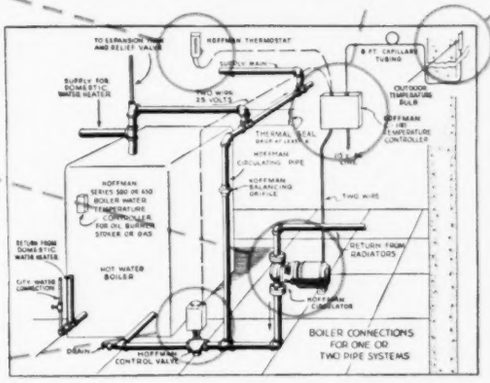
A Packaged Job for the system with mains not exceeding 1½".

Particularly suited for:

1. **Modernizing existing systems.**
2. **Changing Gravity Systems to forced continuous flow systems.**
3. **Changing "on" and "off" forced flow systems to forced *continuous* flow systems.**



A POPULAR PRICED CONTINUOUS CIRCULATION SYSTEM..... *THERMOSTATICALLY CONTROLLED*



HOFFMAN C-141 CONTROLLER: Automatically maintains indoor comfort and temperature by combining Room Thermostat control with continuous circulation of the heating medium.

HOFFMAN CIRCULATOR: Continuously circulates the heating medium throughout the heating season. Automatically stops when outdoor temperature goes above 65° and starts again in the fall when heat is required.

HOFFMAN CONTROL VALVE: An especially designed valve to keep the hot water in the heating system at the desired temperature to maintain heating comfort.

HOFFMAN BALANCING ORIFICE: Engineered to maintain proper balance between the circulating pipe and boiler circuit.

HOFFMAN ROOM THERMOSTAT: Heat anticipating thermostat adjustable to slow, medium and fast cycles.

The Hoffman C-141 Comfort Package offers *precisely controlled heating*—yet the cost is within the budget of even modest homes.

The uniformity of a *continuously circulated* forced hot water heating system can now be obtained with simplified and inexpensive equipment. The Hoffman C-141 Comfort Package combines a Circulating Pump, Temperature Controller, Control Valve and Room Thermostat.

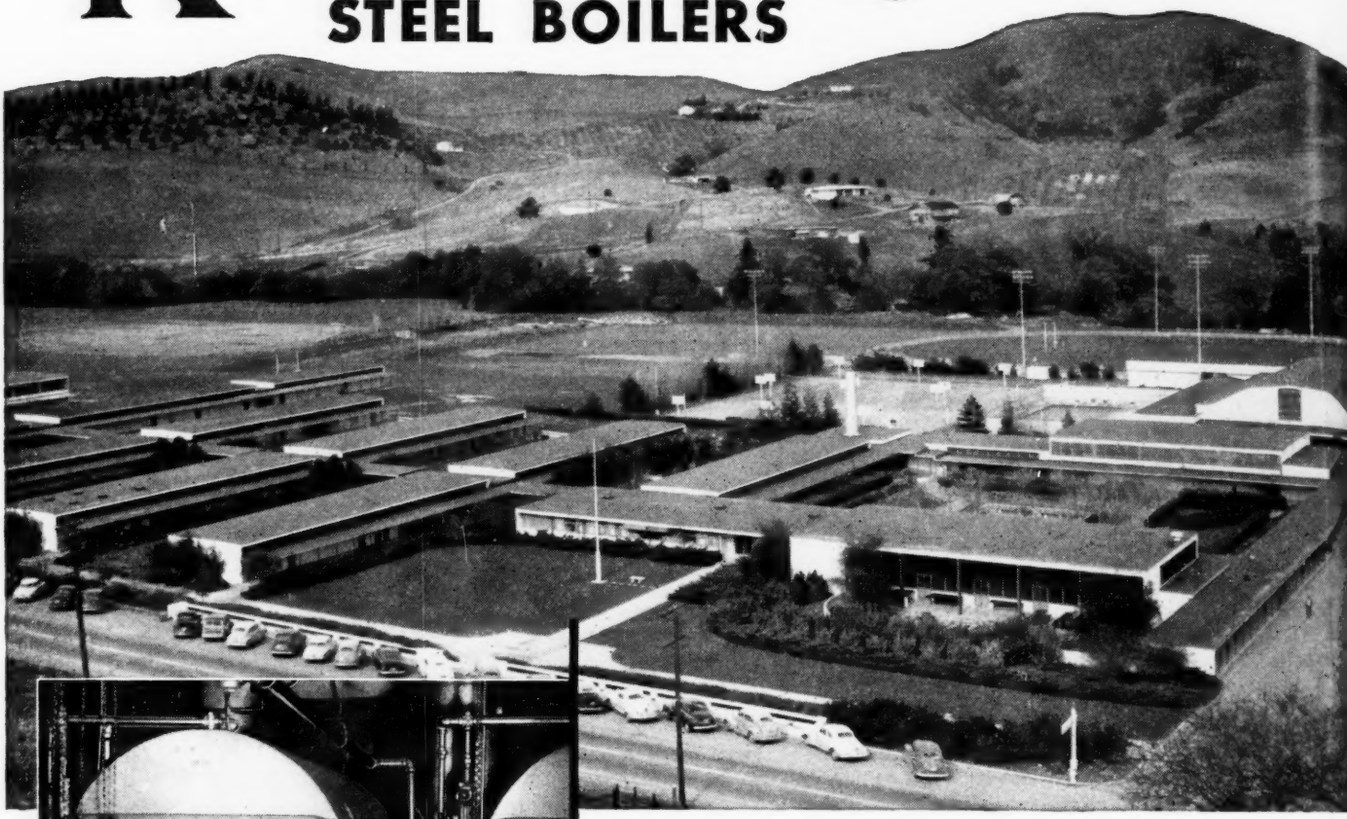
In operation, the C-141 Comfort Package effects a constant balance between heat loss and heat supply, so that the home temperature is held uniform, regardless of weather variations. Note in the diagram that the boiler is by-passed from the rest of the circulating system. Hot water from the boiler is admitted *only* when the room thermostat requires additional heat. Hence the system keeps pace with the actual need for heat and never delivers a fuel-wasting excess. Send for Bulletin No. HW-647.

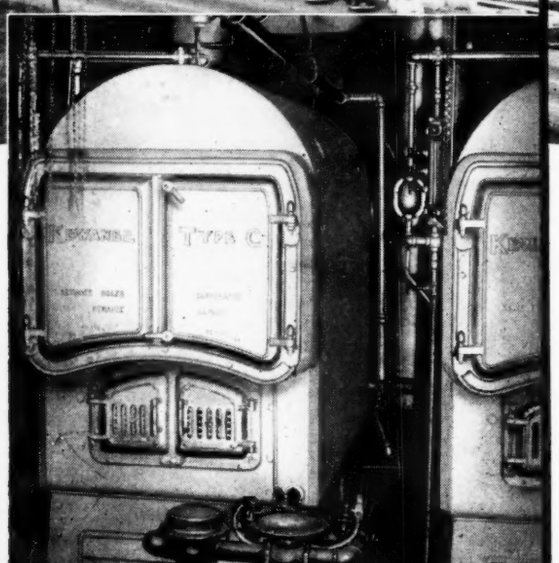
HOFFMAN *Hot Water* CONTROLS

Famous for HOFFMAN VALVES, TRAPS, VACUUM AND CONDENSATION PUMPS, FORCED HOT WATER HEATING SYSTEMS—*Sold by Leading Wholesalers of Heating and Plumbing Equipment.*

HOFFMAN SPECIALTY COMPANY, Dept. HV-6, 3001 York St., Indianapolis 7, Ind.

KEWANEE
STEEL BOILERS





ACALANES UNION HIGH SCHOOL, Lafayette, Calif.
Kump & Falk, Architects
Heated by 3 Type "C" KEWANEE BOILERS producing 8,748,000 Btu.
Monterey County Plumbing Co., Heating Contractors

PREFERRED FOR AMERICA'S MODERN SCHOOL BUILDING

New ideas and functional designing have greatly improve the appearance and usefulness of American Schools. Ne ideas in heating have raised the standards of comfo and a Kewanee Boiler in the specifications will "step up" t operating efficiency of an entire school system.

The Acalanes Union High School at Lafayette, Cali where "every room has a garden", is a typically mode school structure; three Kewanee Boilers were selected insure extra economies along with heating comfort.

And this is one more school to add to the twelve thousa others . . . new and old, large and small . . . where tho sands of Kewanee Boilers perform to perfection.

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Division of American Radiator & Standard Sanitary Corporation

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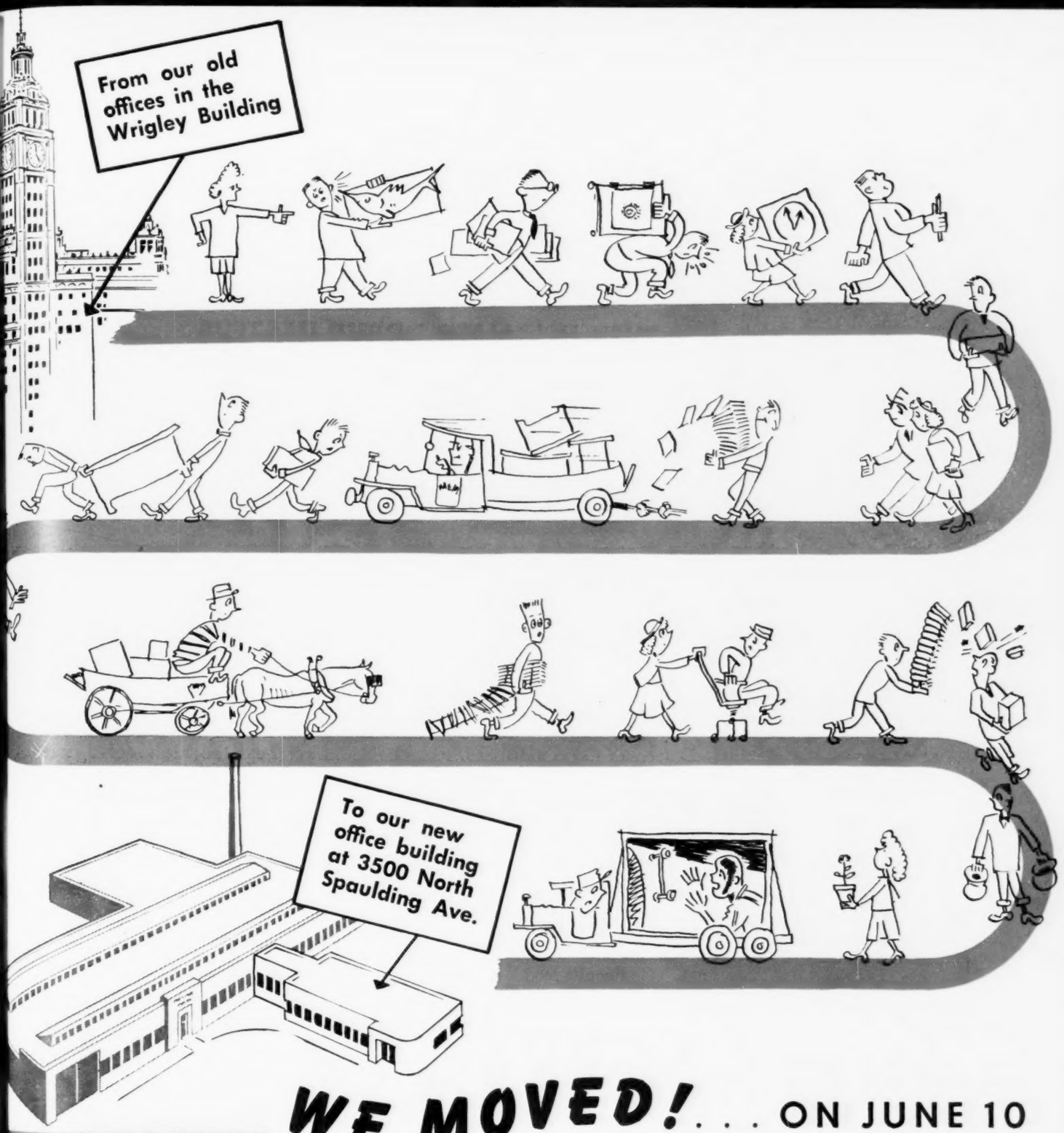


WE MOVED! . . . ON JUNE 10

After 25 busy years in Chicago's friendly Wrigley Building you can bet it was tough to pull up stakes and break up the old ties.

In this case, however, the blow of parting was lightened by the joy of moving into our own home — our new office building just completed alongside our modern plant at 3500 North Spaulding Ave. in Chicago.

This, as the home planners say, is our dream house; every detail of it planned and re-planned to fit every requirement of our general office operations.

We have never conceded anything to anyone in the matter of office operation and despatch . . . *but* . . . now we modestly say: "You aint seen nuthin, yet!"

Make us live up to this by sending your next problem (or order) to our

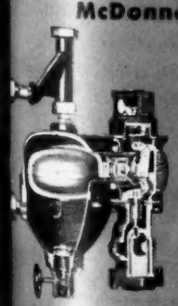
New address of both general offices and plant:

McDONNELL & MILLER, INC.

3500 N. SPAULDING AVE. • CHICAGO 18, ILLINOIS

Telephone COrnelia 7-1600

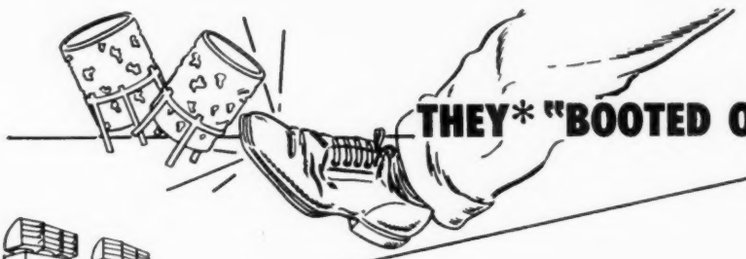
Doing One Thing Well



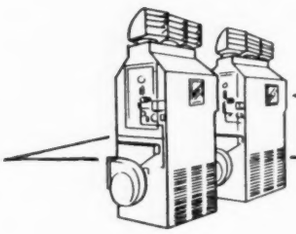
McDonnell No. 47-2 Feeder Cut-off Combination for automatically fired steam boilers up to 5,000 sq. ft. capacity; maximum steam pressure 25 lbs.

McDonnell No. 67 Low Water Cut-off for automatically fired steam boilers of any size; maximum steam pressure, 20 lbs.

McDONNELL *Boiler Water Level Controls*



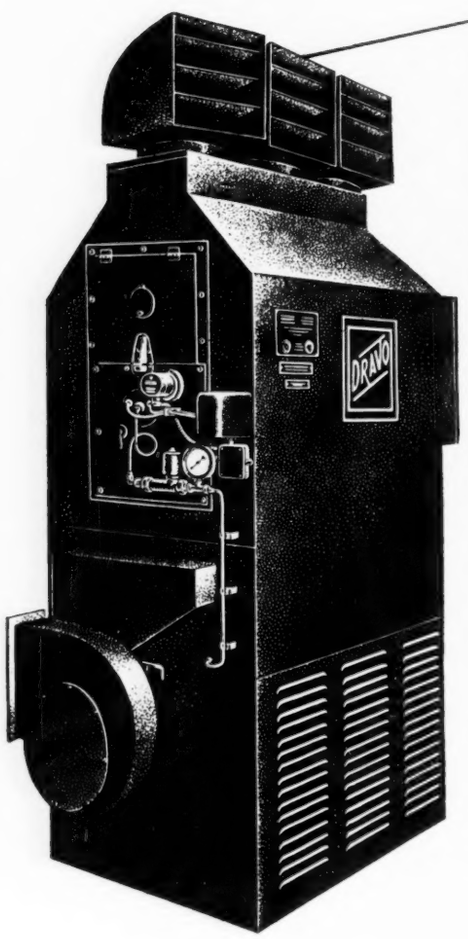
THEY* "BOOTED OUT" SALAMANDERS



THEY INSTALLED DRAVO HEATERS

THEY SAVED $4,372.00 PER YEAR

*Rosedale Foundry and Machine Company, Pittsburgh, Pa.



Like many other metalworking plants, Rosedale, producers of Meehanite Metal castings, depended for years on salamanders for heating. Everyone *assumed* that any more modern method would cost too much, and probably couldn't heat the high-roofed, metal structure much better anyway.

But no one was happy about the situation. Coke and labor were big cost items. Production was lost while men "thawed out." Air was smoky and sulphurous.

So Rosedale investigated, and found (1) that Dravo *Counterflo* Heaters could do the job for LESS cost than salamanders, (2) that Dravo was already heating many similar structures with complete satisfaction, and (3) that Dravo Heaters would help clear up the polluted atmosphere.

Result: four Dravo *Counterflo* Heaters were installed, eliminating 39 salamanders. Yearly cost-reduction is $4372. Even with 25% annual amortization, this company is currently saving $500 a year. After four years the investment will be completely written off, and the entire saving will be velvet. The indirect savings—improved production, greater employee comfort, elimination of coke fumes, and saving in floor space—are extra dividends. Everybody's happy about the heating now.

No one can afford, today, to put up with old-fashioned, inadequate heating equipment—any more than to use old-fashioned production machines. Let us review your heating problems, and provide you with some specific examples of the savings Dravo *Counterflo* Heaters are making for others—and that they can make for you. Consult your classified telephone directory for the name of the local representative—or write us direct.

DRAVO
CORPORATION
DRAVO BUILDING, PITTSBURGH 22, PA.

Dravo also manufactures the *DRAVO CRANE CAB COOLER* for air conditioning hot-metal crane cabs.

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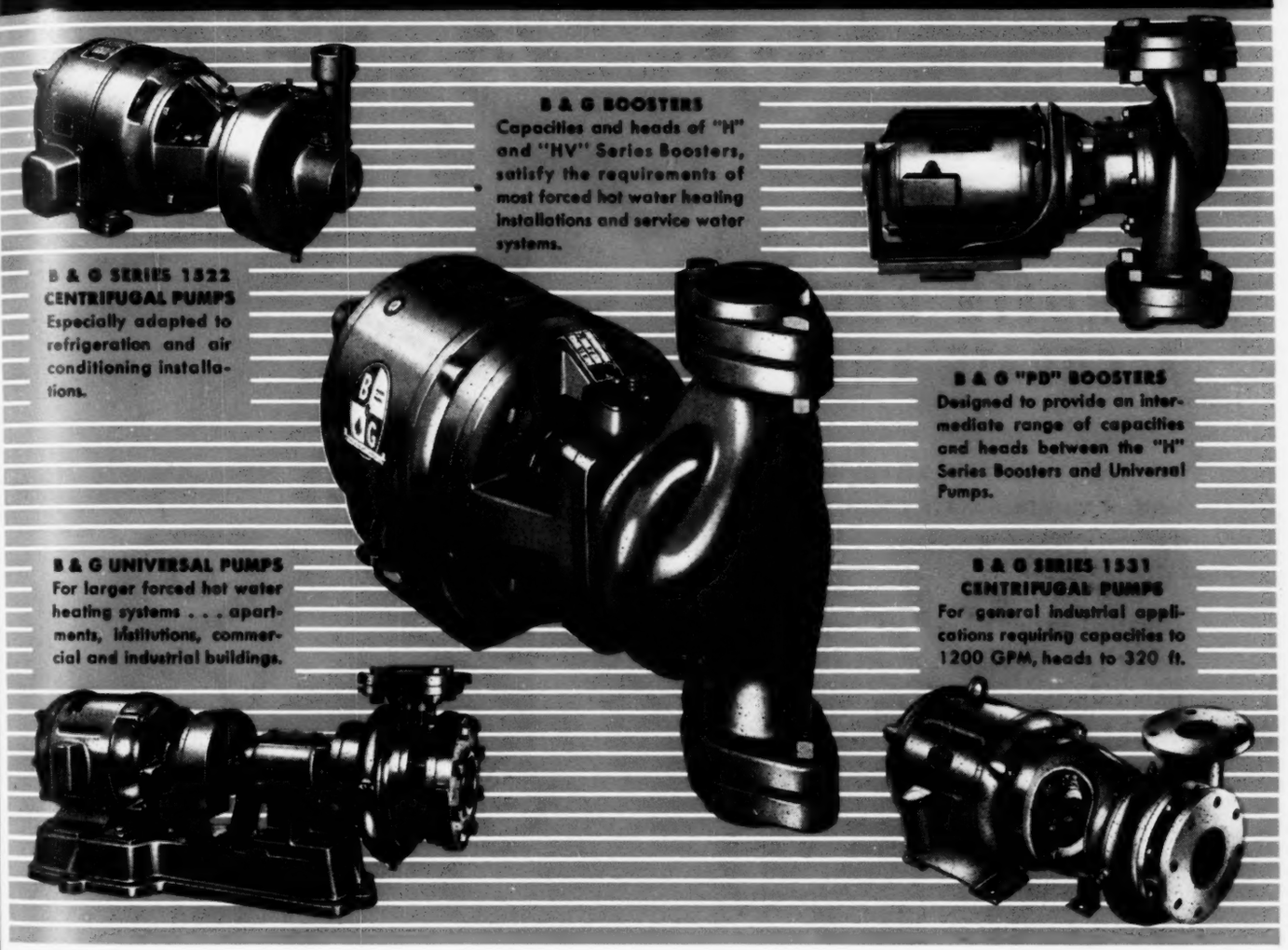
B&G Hydro-Flo* PUMPS

FOR FORCED HOT WATER HEATING SYSTEMS . . . SERVICE WATER SYSTEMS . . . REFRIGERATION AND INDUSTRIAL APPLICATIONS



B & G BOOSTERS
Capacities and heads of "H" and "HV" Series Boosters, satisfy the requirements of most forced hot water heating installations and service water systems.

B & G SERIES 1522 CENTRIFUGAL PUMPS
Especially adapted to refrigeration and air conditioning installations.

B & G "PD" BOOSTERS
Designed to provide an intermediate range of capacities and heads between the "H" Series Boosters and Universal Pumps.

B & G UNIVERSAL PUMPS
For larger forced hot water heating systems . . . apartments, institutions, commercial and industrial buildings.

B & G SERIES 1531 CENTRIFUGAL PUMPS
For general industrial applications requiring capacities to 1200 GPM, heads to 320 ft.

Send today for this up-to-date file of B & G Hydro-Flo Pumps.

The excellence of design and construction which has made the B & G Booster the largest selling pump in its field is now expanded over a comprehensive line of centrifugal pumps.

For any size of forced hot water heating system, B & G Types "H", "PD" or Universal Pumps enable you to make a selection of head and capacity best suited to the job. Service water heating systems likewise can be most economically circulated with these pumps.

For refrigeration, air conditioning and general industrial application, B & G Series 1522 and 1531 Centrifugal Pumps are satisfying the most critical engineers and operating men. "B & G" is the symbol of quality—and your warranty of satisfaction.

BELL & GOSSETT *Company*

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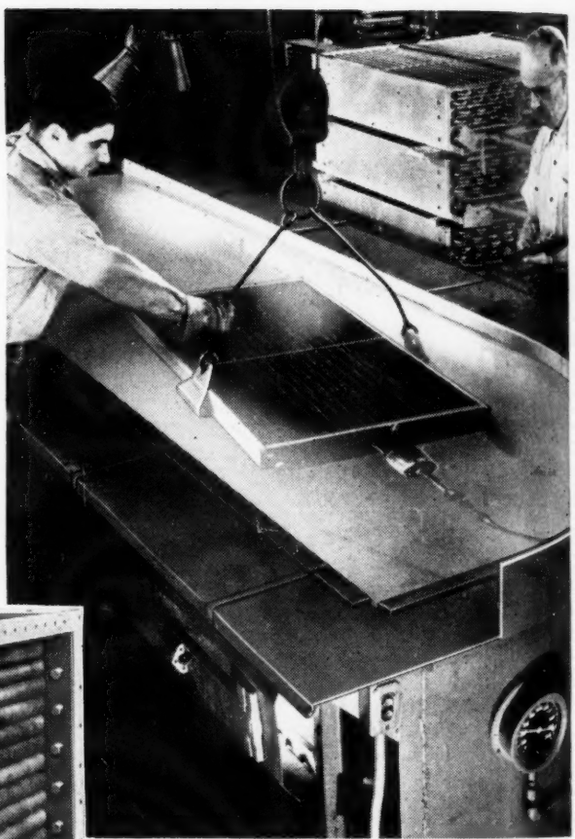
Figure it at

100% FULL RATING

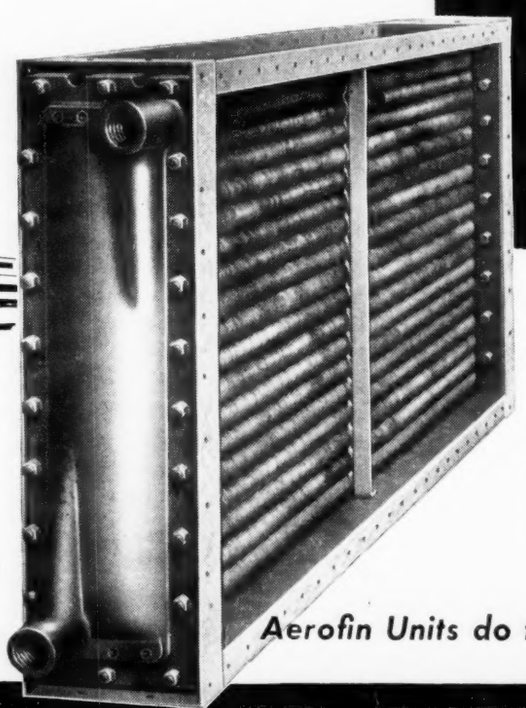
AEROFIN RATINGS ARE ACCURATE AND RELIABLE

Aerofin's continued research has developed accurate ratings that are good for the life of the unit. You can always count on Aerofin to deliver full-rated capacity — full efficiency.

Over 25 years' experience, combined with unequalled production facilities, enables Aerofin to select just the right surface and materials for each particular job. Aerofin rigidly controls every phase of the production of its heat-transfer coils and units.



This man is looking for air bubbles —he is testing Aerofin heat-transfer coils with air pressure in a specially illuminated tank. If there are no bubbles, it means the immersed Aerofin unit has withstood the severe strains of steam and hydrostatic pressure tests and is ready to give you long, efficient service.



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Aerofin Units do the Job Better, Faster, Cheaper

AEROFIN CORPORATION

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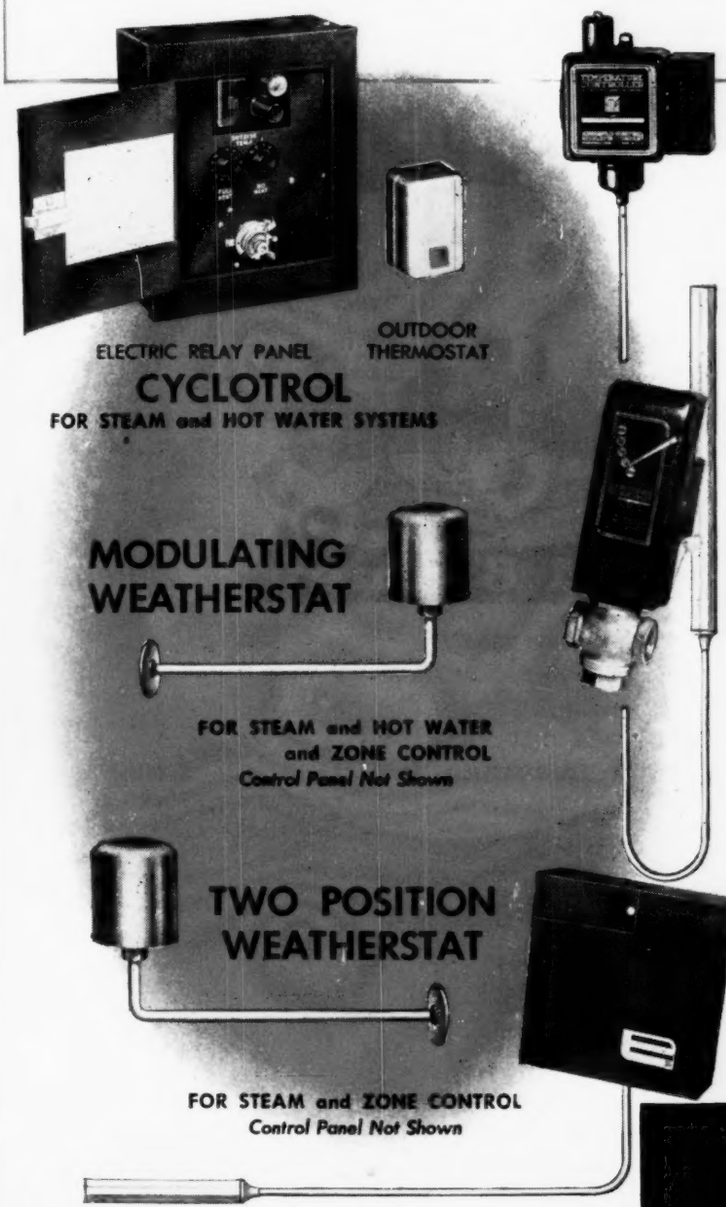
Not Only the Best . . . but the Most Complete Line!

Honeywell Outdoor Temperature Controllers



THERE is an outdoor temperature control system tailor made for every type of building and for every type of fuel—and Honeywell makes it!

Not only is the Honeywell line the most complete, but each individual system is outstanding in its field.

Four basic Honeywell outdoor temperature control systems are available. The new Honeywell Electronic Cyclotrol system is a low cost outdoor controller for steam and hot water systems. The Modulating Weatherstat system is designed for steam, hot water and zone control, while the two position Weatherstat is suitable for steam and zone control. The Aquatrol system is for hot water systems only. All meter the supply of heat in accordance with the weather—delivering less when the outdoor temperature is higher and more when it is colder.

When you think of outdoor control, think of Honeywell. Remember, Honeywell, and only Honeywell, can give you an outdoor control system tailor made for every requirement.

MINNEAPOLIS **Honeywell**

CONTROL SYSTEMS

73 BRANCHES FROM COAST TO COAST WITH SUBSIDIARY COMPANIES IN: TORONTO • LONDON • STOCKHOLM • AMSTERDAM • BRUSSELS • ZURICH • MEXICO CITY

Sell "The Standard of the Industry".

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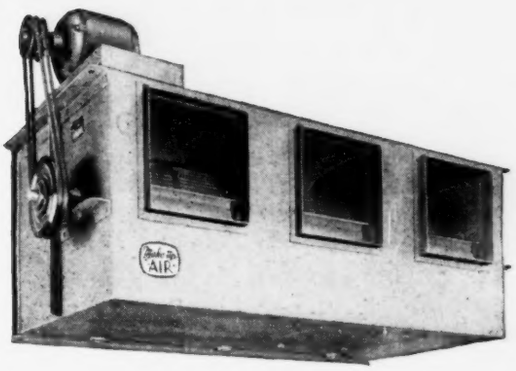


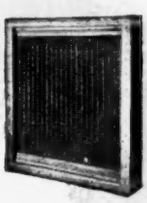
Make-Up AIR Unit

Corrects Air Starvation

Where gases, dust and fumes are removed in large volume with exhaust fans, depleting the air supply within the building, and creating a minus pressure, we recommend the installation of our Make-Up AIR Units.

These simple, compact, ceiling suspended units replace the air from the outside, in an even and constant flow, without drafts or noise; warmed, cleaned and delivered in definite known quantities to balance the known loss. Corrects drafty conditions and uncontrolled infiltration. Furnished in 4 sizes from 5,000 CFM to 20,000 CFM.

Bulletin 502 gives full details.



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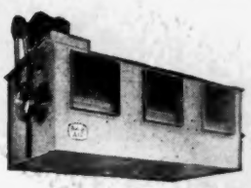
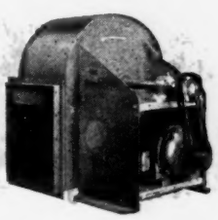
All NEW YORK BLOWER COMPANY products are laboratory tested, accurately rated and fully guaranteed in strict accordance with Standard Test Codes.





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THE NEW YORK BLOWER COMPANY

GENERAL OFFICES • 32nd STREET & SHIELDS AVENUE • CHICAGO - 16

FACTORIES AT LAPORTE, INDIANA AND CHICAGO, ILLINOIS

Air Conditioning in Textile Mills*...

by **P. L. Davidson, Philadelphia, Pa.**
and **John deB. Shepard, Greenville, S. C.**
Consulting Engineers

Philip L. Davidson

John deB. Shepard

Question: Is a Central Station System more desirable than a Unit System?

Answer: "Both have obvious advantages. In a central station versus units, the cost of the base mechanical system is approximately equal. The former's cost exceeds that of the unit because it requires enclosure. This added cost, however, is offset by inherent easier maintenance and improved operating efficiency. Units, generally, should be limited to a capacity of 12,000 cfm. Central stations are often not practical beyond one floor of multistory mills, or to exceed 150,000 cfm."

Question: Does refrigeration have a place in textile mills?

Answer: "Definitely. Recent refrigeration installations give quick opportunity to spot effects of constant temperature in improved machine operation and handling of fibres. Current experiences with central systems reveal: (1) In a weave room operating on rayon fabrics with a modern central station humidifying system, the loom stops ranged from 2.3 to 5.4 per producing loom hour. The loom efficiencies averaged 92.6%, the seconds ranged between 15 and 16%. *When refrigeration was added*, the loom stops over a period of two months dropped to a range of 1.2 to 2.9. The efficiencies rose to 96%; the seconds dropped to a range between 4 and 7%.

(2) "A cotton spinning mill, after the installation of refrigeration, increased its spindle speeds 5% and its work load 14% with no increase in ends down.

(3) "A weave room running on combed broadcloth showed, after installation of refrigeration, an increase in production of 4½ to 5%.

(4) "A New England mill reported a 25% increase in production in a spinning room after the installation of a central station air conditioning system with refrigeration. This was attributed primarily to a decrease in absenteeism and only secondarily to a decrease in ends down.

"Records such as these highlight the results obtained with central station equipment where refrigeration is employed to fix temperatures constantly within a range of maximum efficiency and reasonable employee comfort. Advantages are frequently realized at an investment no greater than that required with straight or 100 per cent air systems.

"*This experience, proven in the textile field, should be significant in setting the pattern for all industrial air conditioning.*"

• • •

YORK SALES POLICY

York believes in channeling contract work through Architects, Engineers and Contractors. You are therefore assured of unequaled support toward providing the finest air conditioning systems for your clients. York Corporation, York, Penna.

York's complete line of refrigerating and air conditioning products is the result of 65 years of resultful research and encompass:

1. a complete line of equipment
2. competitive prices
3. accurate, dependable product ratings
4. technical assistance based on "case histories"
5. cooperation with architects, engineers and contractors
6. practical help from York-trained engineers
7. a national organization
8. continuous product research and development
9. certified maintenance

York refrigeration air-conditioning

The big advances come from

YORK

Headquarters for – **Refrigeration and Air Conditioning**

This advertisement condensed from an article authored by these consulting engineers, and published in* **Refrigerating Engineering, *February, 1950*

Industrial heating goes modern too!

Steel pipe is first choice for radiant heating advantages

Remember when a heating plant was just intended to keep folks warm? That day is gone!

Heating needs of modern business now go far beyond that of merely providing for human comforts. Today's heating systems must often function in capacities involving such requirements as quality of heat, consistency of temperature, preservation of humidity levels, conservation of space, and even psychological factors of health and efficiency.

Radiant heating has often proved the successful solution to such heating problems, and steel pipe, of course, is the logical choice for successful radiant heating systems.

There are many good reasons why. For one, steel pipe has more than 60 years of proved performance behind it in conventional hot water and steam heating systems. It has become almost standard material for this use. Then, too, steel pipe is economical, easy to form and weld, durable, and its expansion and contraction in concrete or plaster for all practical purposes may be considered the same.

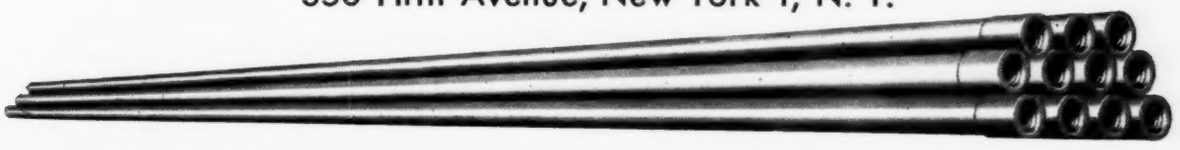
Yes, steel pipe is first choice for radiant heating in modern industrial buildings, public buildings, schools, churches and homes.

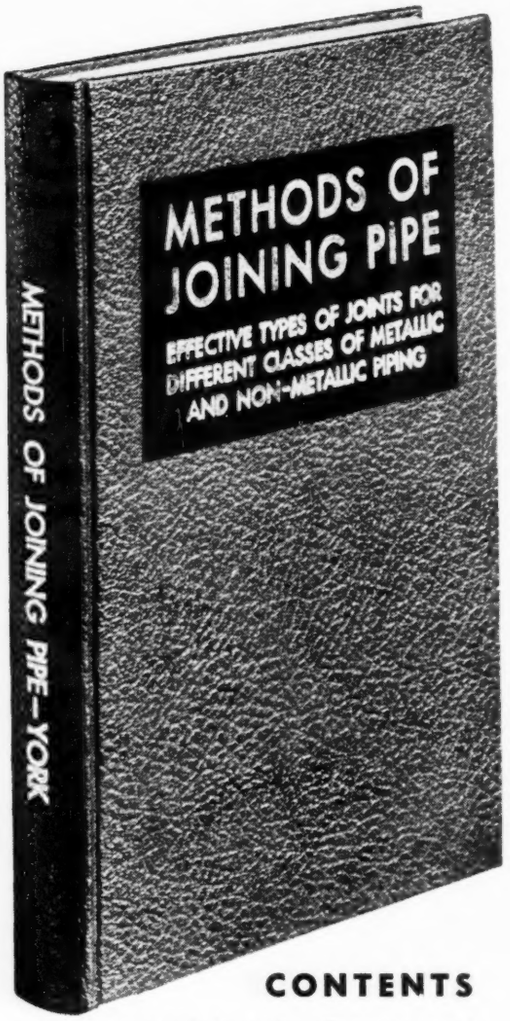
This modern warehouse and operating building of The Peoples Natural Gas Company, Pittsburgh, Pa. incorporates a steel pipe radiant heating system for warmth, protection of delicate instruments and even for snow removal.

COMMITTEE ON STEEL PIPE RESEARCH

AMERICAN IRON AND STEEL INSTITUTE

350 Fifth Avenue, New York 1, N. Y.




METHODS OF JOINING PIPE
EFFECTIVE TYPES OF JOINTS FOR DIFFERENT CLASSES OF METALLIC AND NON-METALLIC PIPING
METHODS OF JOINING PIPE—YORK

Just Published

A 236-page treatise covering all types of standard and special joints for pipe, illustrated by 249 drawings.

METHODS OF JOINING PIPE

by J. E. YORK
Building Service Engineer
Stone & Webster Engineering Corp.

Here is a book written by an experienced engineer who knows pipe joints.

It explains briefly and clearly the advantages and disadvantages of a large variety of joints for connecting both metallic and non-metallic pipe lines.

You will find illustrated descriptions of joints for cast iron, copper, brass, Duriron, lead, chemical tile, vitreous tile, stoneware, Transite, wood, glass, synthetic resin, plastic and concrete pipe.

You will also find joints applicable to piping systems for hot or cold water, brine, refrigerants, gases, distillates, chemical solutions, acids and other fluids.

CONTENTS

1. Screwed Joints for Ferrous and Brass Pipe
2. Flanged Pipe Joints
3. Welded and Brazed Pipe Joints
4. Methods of Joining Cast Iron Pipe
5. Joints for Thin-Walled Tubes
6. Joints for Plumbing and Chemical Resistant Pipe
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Send me a copy of METHODS OF JOINING PIPE—Price, $3.00, which I enclose. I have the right to return the book within 5 days If not satisfied and my money will be refunded. (Please add 40¢ postage for Canadian or foreign orders.)

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MARSH *throughout*

. . . in this new Men's Residence Center at INDIANA UNIVERSITY

ARCHITECTS
Burns & James, Indianapolis, Indiana
MECHANICAL ENGINEERS
Bevington, Taggart and Fowler, Indianapolis, Indiana
HEATING-CONTRACTORS
Freyn Bros. Inc., Indianapolis, Indiana

At an open house party held last November, well wishers of Indiana University attended the formal unveiling of this impressive, new 4½-million dollar men's residence center occupying five acres of the campus at Bloomington, Indiana.

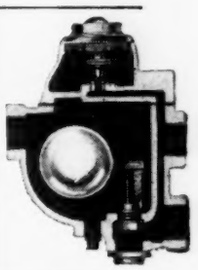
What they saw heightened their traditional hoosier pride. Inside the massive H-shaped building they found 522 comfortable rooms for men students; 18 sunny lounges; a welcoming 120 x 40-foot main lounge with large adjoining library and administrative offices; a 16,000 sq. ft. dining room large enough to seat all residents at one time.

They also found ideal heating comfort. Special emphasis had been placed on the heating phase; and judicious engineering, excellent equipment and expert installation had combined to achieve ideal heat distribution with maximum efficiency and economy.

As in so many critically engineered heating systems Marsh heating specialties were used throughout. The traps included a large number of Marsh float and thermostatic traps as well as inverted Bucket traps. The job was basically hot water, so of course hundreds of Marsh radiator valves were used in the system.

The selection of Marsh equipment here is one more example of the preference accorded Marsh in scores of large and exacting jobs. It will pay you to insist on this equipment that is always first choice where only the best is good enough. Ask for new bulletins.

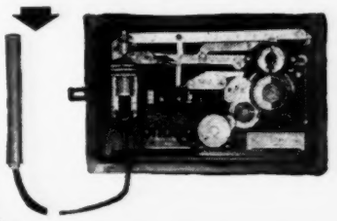
Hundreds of Marsh Packless Radiator Valves were used in the large hot water distribution system.



A large number of Marsh Float and Thermostatic Traps like this were used.

BIG SAVINGS when the heat control is MARSH TRI-TROL

For multiple occupancy buildings of any size TRI-TROL is the simple low-cost, easily installed regulator, giving control "in step with the weather" that means ideal heating comfort at minimum cost. Ask about it.



MARSH HEATING EQUIPMENT CO.
Sales affiliate of Jas. P. Marsh Corporation
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MARSH *Heating Specialties* SINCE 1865

THESE COPPER-BEARING STEEL SHEETS

LAST CONSIDERABLY LONGER

(and cost very little more than ordinary galvanized sheets)

Heating or ventilating ducts made from Beth-Cu-Loy Galvanized Sheets can be expected to last longer than those made from plain galvanized steel sheets.

The principal reason for this long service is the resistance to rust provided by Beth-Cu-Loy's copper-bearing steel base. It is manufactured from open-hearth steel that contains 0.20 to 0.30 pct copper. In atmospheric-exposure tests by the American Society for Testing Materials this composition has proved to have more than double the resistance to corrosion found in ordinary open-hearth steel.

Aside from their lasting qualities, Beth-Cu-Loy Sheets are easy to form, to seam and to solder. They make fast work of difficult jobs. Their very slight additional cost is balanced many times over by their longer life and excellent workability.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by
Bethlehem Pacific Coast Steel Corporation
Export Distributor: Bethlehem Steel Export Corporation

Beth-Cu-Loy Galvanized Sheets

BETHLEHEM STEEL

Washington News

LORING F. OVERMAN

THE 81st Congress which assembled in January is beginning to wonder how five months could slip by so rapidly with "So much to do, so little done."

Unless something extends the session beyond the statutory limit of July 31, the next few weeks should see legislative chips fly in all directions. Members of Congress will certainly make every possible effort to adjourn on schedule—for all members of the House, and one-third of those in the Senate are up for reelection. Understandably, all candidates will want to be on their home grounds mending fences and campaigning.

Thus the next few weeks are danger weeks in Washington—the threat being that legislation which might otherwise be considered long and seriously, may now be passed in haste under the lash of adjournment tactics.

The Senate is currently concerned primarily with appropriations and social security—two measures already passed by the House. Consideration of fair employment practice legislation has been set aside for the moment, and the time limit has expired for consideration of several of the Hoover reorganization plans which had tied up the Senate.

Assuming that social security and the omnibus appropriations bill are handled promptly, there is still the question as to whether time enough will remain to act upon such matters as ECA funds, basing point legislation, increasing the lending power of the Commodity Credit Corporation, rent control extension, draft extension, postal rate increases, displaced persons, statehood for Alaska and Hawaii, federal aid-to-highways, to schools, and to small business.

While it is possible that some important legislation will be dropped in the final adjournment rush, it should not be forgotten that Congress can be geared to act rather quickly when occasion requires. All of the months that have gone before should not be considered wasted. Those months were devoted to committee hearings, to study of the proposed legislation, to contacts with constituents. Thus, when a piece of legislation finally reaches the House or Senate floor, there are usually plenty of indications as to its fate. All members of the team have their signals, and all know what the play is to be.

Unless unexpected opposition develops, the passage or failure of a measure can customarily be foretold before the balloting starts.

Appropriations First

Although some measure may die for lack of attention, those providing funds to run the government will not be forgotten. The House, heeding the public's interest in reducing federal expenditures, cut nearly a billion dollars from the omnibus appropriations bill before passing it to the Senate. The Senate, considering the 28.7 billion dollar measure, is being pressured to restore some of the cuts made by the House.

One House cut, for example, would require all nonmilitary government agencies to make blanket cuts totalling $600 million by reducing personnel, travel expenses, printing, supplies, and the like. Such a cut, it has been estimated, would take about 200,000 persons off the federal payroll. Another House-passed amendment would prohibit federal agencies from filling more than 10 percent of their job vacancies during 1951—saving an estimated $371 million.

The Senate Appropriations Committee, which is about ready to submit its version of the omnibus appropriations bill to the Senate, is trying to work out something less drastic. It favors a plan of giving the Budget Bureau authority to withhold funds appropriated by Congress to federal agencies, plus the authority to release such funds in emergencies.

Such a plan, if adopted, would appear to place the Budget Bureau in the role of Simon Legree—able to give or to take away at its pleasure. Although relieving Congress of the embarrassing task of making a hard decision, it is difficult to picture one government agency turning down another's plea for funds to perpetuate itself.

In any event, the economy-minded will probably have a difficult time when the appropriation bill reaches the Senate floor about mid-June. Senators would probably welcome a word from constituents to encourage economy-mindedness.

RFC Protests

While the Administration's family of alphabetical agencies may usually be depended upon to play along with the team, there are indications that the Federal Reserve System is none to happy about President Truman's proposal "to provide loans to small business." The proposal, embodied in bills introduced in House and Senate, includes a five point program:

1. Provide for the insurance, on a self-sustaining basis, of small business loans up to $25,000, repayable within five years;
2. Authorize the federal government to promote and charter national investment companies "to increase the availability of venture capital to small and independent enterprises";
3. Broaden the lending powers of the RFC by relaxing its collateral requirements on loans to small business, and increasing to 15 years the present 10-year maximum on all types of business loans;
4. Strengthen and improve the technical and managerial aids now provided by the Department of Commerce "to help smaller business become more efficient";
5. Place the entire responsibility for this program with the Secretary of Commerce, with the exception of the national investment companies, which would be administered by the Board of Governors of the Federal Reserve System.

In urging Congress to pass the aid to small business program, President Truman recommended that super-

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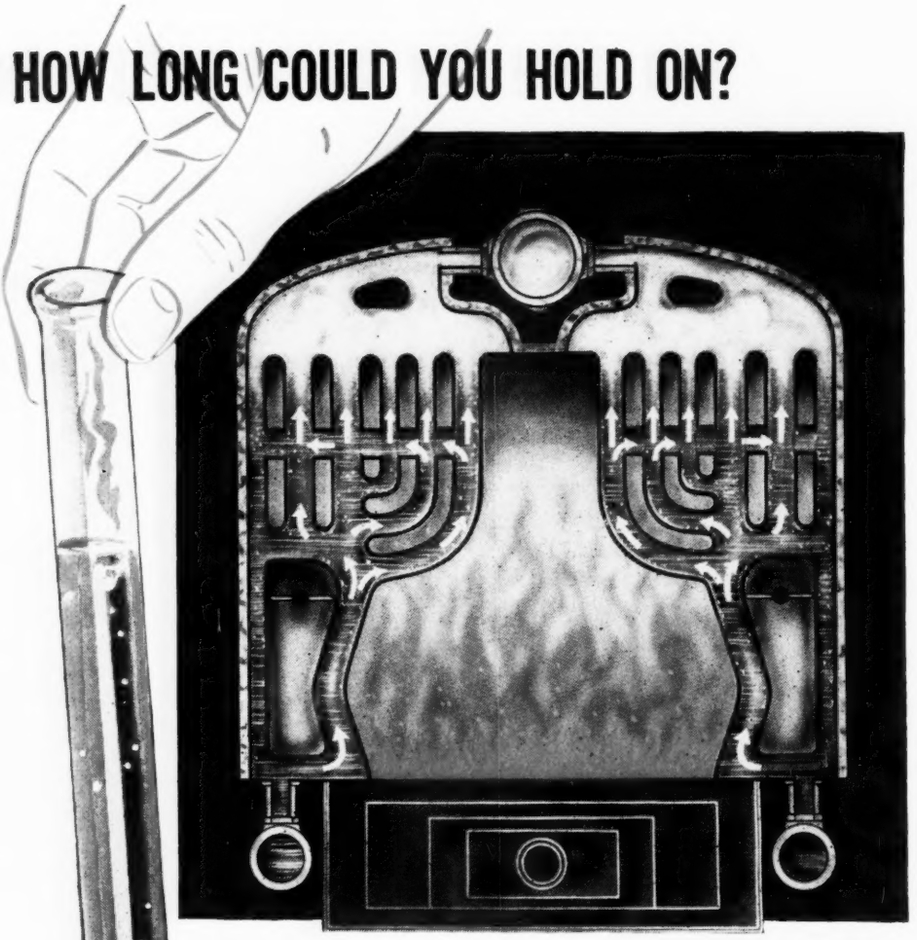

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. . . just the way they flow up this test tube held over the Bunsen burner. In a matter of seconds you'd have let go.

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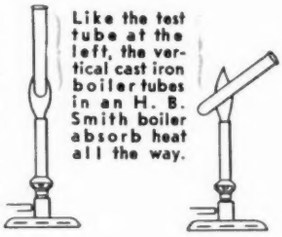
There are other reasons of course. 1) Less soot clings to the smooth vertical tubes —they are virtually self-cleaning. 2) Water tube design means maximum heating surface. 3) Properly proportioned channels between the tubes permit free passage of the hot gases with low draft loss. 4) Sections are all grey iron for low maintenance —long life. H. B. SMITH boilers have been in service for more than 65 years. 5) Header type construction permits operation with one or more sections out of service, if necessary.



Like the test tube at the left, the vertical cast iron boiler tubes in an H. B. Smith boiler absorb heat all the way.

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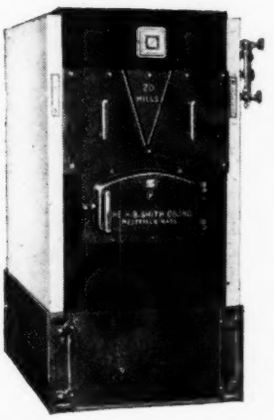
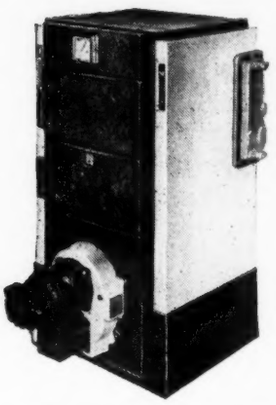
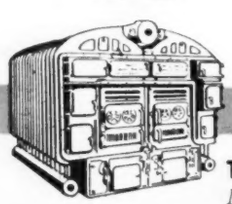


SMITH-MILLS "20" BOILER for Hand Firing. Four models for steam heat, four models for hot water heat — each equipped with built-in water heater for unfailing supply of domestic hot water.



SMITH-MILLS "100" BOILER-BURNER UNIT. A complete heating plant for the average home—four models in steam, in hot water heat. Equipped with oil burner and tankless heater or tank connections. Extended type jacket available.

You may be interested to know that H. B. Smith manufactures the most complete line of modern cast iron boilers in the world. Let us help you satisfy your customers with convincing data and case histories.



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Most complete line in the world of cast iron boilers for heating

vision of the RFC also be turned over to the Secretary of Commerce. A reorganization plan to accomplish this has already been submitted to Congress.

It is this latter recommendation that struck fire within RFC, and if some of that agency's "high officials" are quoted correctly, they talk like Republicans. For instance:

"What small business needs is incentive, not loans. If you really want to help small business you should give it some tax relief. Small business should be given a chance to stand on its own feet, not just a temporary crutch. Too many people have the mistaken philosophy that the way to cure anything is to lend money."

May Lose Fannie Mae

All of the foregoing are comments attributed to RFC people critical of the small business loan plan. They have another reason for being critical of the Administration. The other is that a Hoover commission proposal submitted to Congress early in May, would turn RFC's profitable Federal National Mortgage Association (known as Fannie Mae) over to the Housing and Home Finance Agency. While there is some question as to whether Congress will vote the small business loan plan into action, the likelihood that HHFA will take over "Fannie Mae" is very real. This agency, which buys and sells mortgages insured by the Federal Housing Administration and the Veterans' Administration, is reportedly the RFC's best money-producer.

There are some who feel that RFC has served its purpose and should be discontinued. Apparently its executives see—in the move of lopping off Fannie Mae and putting RFC under the wing of the Department of Commerce—a move in the direction of annihilation. And such a fate, for a government agency, is unheard-of. Originated in 1932 as a depression pump-priming organization, RFC was ordered by Congress in 1937 to gradually discontinue its operations. But before this could be done a minor slump occurred in 1938 and RFC was authorized to make new loans. National defense and wartime needs kept it going again.

In 1939, RFC was one of several lending agencies grouped under the Federal Loan Agency. From 1940 until 1945, FLA and its satellites, including RFC, remained under the Department of Commerce. In mid '45 the FLA group resumed their previous status, and in 1947 RFC regained its independence and FLA was abolished.

If RFC fears that it will again lose its independence, it is not alone. Senator Bridges of New Hampshire, says that the small business loan program is a sure way for the small business man to lose his own independence. "The promise of loans is a promise of only more government interference," the Senator observes.

Tax Question

The House Ways and Means Committee, searching for new revenues to offset the $1.1 billion which it has tentatively cut from the revenue total through reductions in excise and capital gains taxes, may find that delay has itself solved the problem.

Business has improved to such an extent that revenue from taxes for the fiscal years 1951 and 1952 will be higher than estimated. At the same time, expenditures will be somewhat lower. The government deficit for 1951, while plenty large, will not be as large as estimated in January.

Thus it begins to appear that there may be very little change in tax rates, if any. Excise tax cuts will be vetoed, the President has said, unless accompanied by offsetting increases. The Committee is having difficulty finding any class of taxpayer who does not strongly protest having his present levy increased. Any tax rate changes made are likely to be moderate —not too heavy for election year handling; not so marked as to risk a Presidential veto.

Housing Costs Up

As predicted by the building industry, the cost of residential construction is on the climb. Opponents of the government's slum clearance and low rent housing programs, point out that the program has built a construction boom on top of a boom, forcing the price of building materials and labor sky-high. Real estate spokesmen contend that the housing shortage is nearing an end and that the current building season—with starts at the rate of 1.5 million a year—should solve the entire problem of housing.

Meanwhile, the House Banking Committee has approved for action by the House, a proposal to allow municipalities to remove federal rent controls between June 30 (the expiration date of the present law) and December 31, 1950. After that, municipalities would remain under federal rent control only if local governing bodies or residents so voted.

The House is expected to pass the rent control measure, but Senate action is uncertain. In previous years, however, both houses have been able to squeeze through rent control legislation at the very last moment if need be. This year will probably be no exception, for it is being said that members of Congress would prefer to have rents remain in status quo until after elections.

Foreign Aid

Heating and ventilating folks whose activities take them into the weapons fields will be interested to know of President Truman's request for $1.2 billion to strengthen the war arm of 14 countries.

This will be in addition to some $2.9 billion in third year funds for Marshall Plan aid—important figures because of their influence upon the domestic economy. Taken all together—foreign aid, military aid, election-bolstered domestic markets—the business trend is definitely in the boom cycle, with no foreseeable slackening apparent.

Auto output, reported at a 9 million annual rate for cars and trucks, is at or near record figures.

Steel output, above 100% of rated capacity, is at its peak.

The boom at the present stage rests on steel, autos and construction. Next look for pickup in the industrial equipment industries; then soft goods. From all indications, 1950 is to be quite a year, with Congress hurrying, with the Administration taking all the credit, and with business continuing in high gear in spite of itself.

BRIEFLY STATED

• The National Constructors Association, composed of 20 of the nation's builders of oil refineries, steel mills and chemical plants, has announced its intention to resist efforts of groups within the construction industry promoting the passage of legislation that would require submission of separate bids, directly to the owner, on electrical, piping and other specialty work.

• The Residential Gas Section of AGA held a two-day sales meeting at Pittsburgh April 17 and 18 for the Eastern Natural Gas Regional Sales Council. More than 200 sales executives and representatives of gas utility and appliance manufacturers attended.

• At the Eighth Annual Anthracite Conference held at Lehigh University May 4, delegates voted to continue this year's practice of confining the conference to a single day.

• Postwar heat transfer development will be the theme of an international discussion to be held in London, on September 11 to 13, 1951. Plans for participation by engineers in the Western hemisphere are being arranged by the Joint Committee on North American Participation, which consists of representatives of various U. S. and Canadian engineering societies. The ASME is coordinating administrative details.

• Total sales of gas by utilities in March, 1950 increased 27.9% (estimated in therms) over March, 1949, according to AGA figures.

• Condensation on the underside of floors in houses built over crawl spaces can be controlled by treatment of ground surfaces under basementless houses and proper ventilation of crawl spaces, according to a recent publication of HHFA. The publication, *Crawl Spaces*, is available from the Superintendent of Documents, Government Printing Office, Washington 25, D. C. The sale price is 15 cents.

• Money made available to a local slum clearance project through a temporary Federal loan may be used, according to Nathaniel S. Keith, Director, Division of Slum Clearance and Urban Redevelopment, Housing and Home Finance Agency, for such purposes as: (1) administrative and planning costs and carrying charges; (2) legal expenses; (3) acquisition of project land; (4) demolition of existing structures and improvements; (5) installation, construction, or reconstruction of streets, utilities, and other site improvements essential for new land uses; and (6) making the land available for development or redevelopment by private enterprise or public agencies.

• All apartments will be air conditioned in a new 284-family apartment project in Floral Park, Long Island. Childs Garden apartments, under construction at a cost of $3.5 million by the Robert Metrick Company, will feature one or more ½-hp Frigidaire window room air conditioners. Rentals range as low as $58.50 per month.

• The AiResearch Manufacturing Co. of Los Angeles will supply complete pressurization and air conditioning for the fleet of 65 Martin 4-0-4 twin engine, high altitude commercial transports recently ordered by Eastern Airlines and Trans World Airlines. Major units of the AiResearch system will include the cabin supercharger, the turbine refrigeration unit, pressure and temperature controls.

• A boiler plant with a steam capacity of 450,000 lb per hr will be erected at the Public Health Service's National Institute of Health Clinical Center at Bethesda, Maryland. The installation will also include refrigeration machines which will deliver 10,500 gallons of water a minute for 5,250 tons of air conditioning.

• A report of tests for condensation on reflective insulation under wooden floors laid over crawl spaces is featured in the January issue of the HHFA Technical Bulletin. The report, written by Laurence Shuman, describes tests at the National Bureau of Standards.

• Development of a blueprint for mobilization of the construction industry was advocated in an address by Otto F. Sieder, executive vice president and general manager of the H. K. Ferguson Co. at the Industrial College of Armed Forces in Washington. Mr. Sieder recommended the immediate establishment of a committee composed of Army, Navy and Air Force officers and representatives of leading engineering and building concerns to set up this program. The absence of such a plan at the start of World War I resulted in many difficulties that could have been avoided, Mr. Sieder said.

• Installation of a snow melting system serving 12,000 sq ft of sidewalk area around the new 25-story Mutual Life Building in New York includes 14,000 linear feet of Rayduct, a steel pipe manufactured by Bethlehem Steel Corporation. A water and anti-freeze mixture will be heated to about 140F in heat exchangers using steam from the New York Steam Corp.

• Industry and government are spending about $100 million a year on air pollution control, according to federal figures. About $10 million was spent in Los Angeles County, California, alone during the past two and one-half years on control equipment, process analysis, and stack sampling. More than $2.25 million of private and public money also was spent to identify contaminants and their spread. Various cities in New York State spent more than $5.5 million in 1948 and 1949, according to estimates of the New York State Health Department.

• The Trane Company, La Crosse, Wis., has issued a new compact cooling and heating load estimating sheet for engineers, contractors and architects. Sheets are printed on 8½ by 11 transparent bond to permit blueprint and black line reproduction and are punched for ring binding. More items are included than in previous 11 by 17 sheets. Pads of 50 are priced at 50 cents per pad, with quantity reductions.

"The Air Force crash entry suit consists of multiple layers of metallic foils and high-temperature-resisting conductive insulation, and is designed to provide adequate protection up to an exterior temperature of 2000°F."

From a letter by
COL. E. J. KENDRICKS, Medical Corps (USAF), Chief, Aero-Medical Laboratory, Engineering Division.

U. S. AIR FORCE CRASH FIRE FIGHTERS DEMONSTRATE:

Radiation dominates heat flow in air spaces (in buildings)

Conduction and Convection are minor

Multiple layers of low-emissive aluminum do not absorb nor emit appreciable heat

Infra-red heat rays travel through space, including icy-cold air, in every direction, up, down, sideways, from warm to cold. They engender no temperature until absorbed by a surface.

A news release from Wright Patterson Air Force base says of the accompanying photograph: *"In the center the 'bunkin' suit, now in use by airplane crash fire-fighters, has become too hot for its wearer and is being wet down. The aluminum foil laminate suit at the left, developed by AMC's Aero-Medical Laboratory, was found to give its wearer the greatest comfort and protection and suffered least damage during the test. The foil reflects the extreme heat and helps the wearer retain a relatively low body temperature while fighting airplane crash fires."*

Multiple layers of accordion aluminum permanently compartmented with cellular reflective spaces, reject 97% heat rays and emit only 3% on opposite side. This structure, available commercially, is technically called Infra Accordion Aluminum Insulation. Installed between wood joists in new construction, material and labor, Type 4 Infra costs less than 7½¢, Type 6 less than 9¢ sq. ft.

Details of how multiple accordion aluminum with reflective air cells stops waste of heat or its unwanted intrusion, including heat by convection and conduction, in residential, commercial, and industrial buildings; and prevents vapor flow and condensation, sent on request.

Get *Valuable Free Copy* of new, revised "Simplified Physics of Thermal Insulation," authoritative, simply-written, 44-page manual on heat and vapor flow, condensation, radiant heating, etc. Tells about Radiation, Convection and Conduction. Just off the press. Master Chart gives *k*, C, R, and U factors of all insulations, of all thicknesses, weights, densities.

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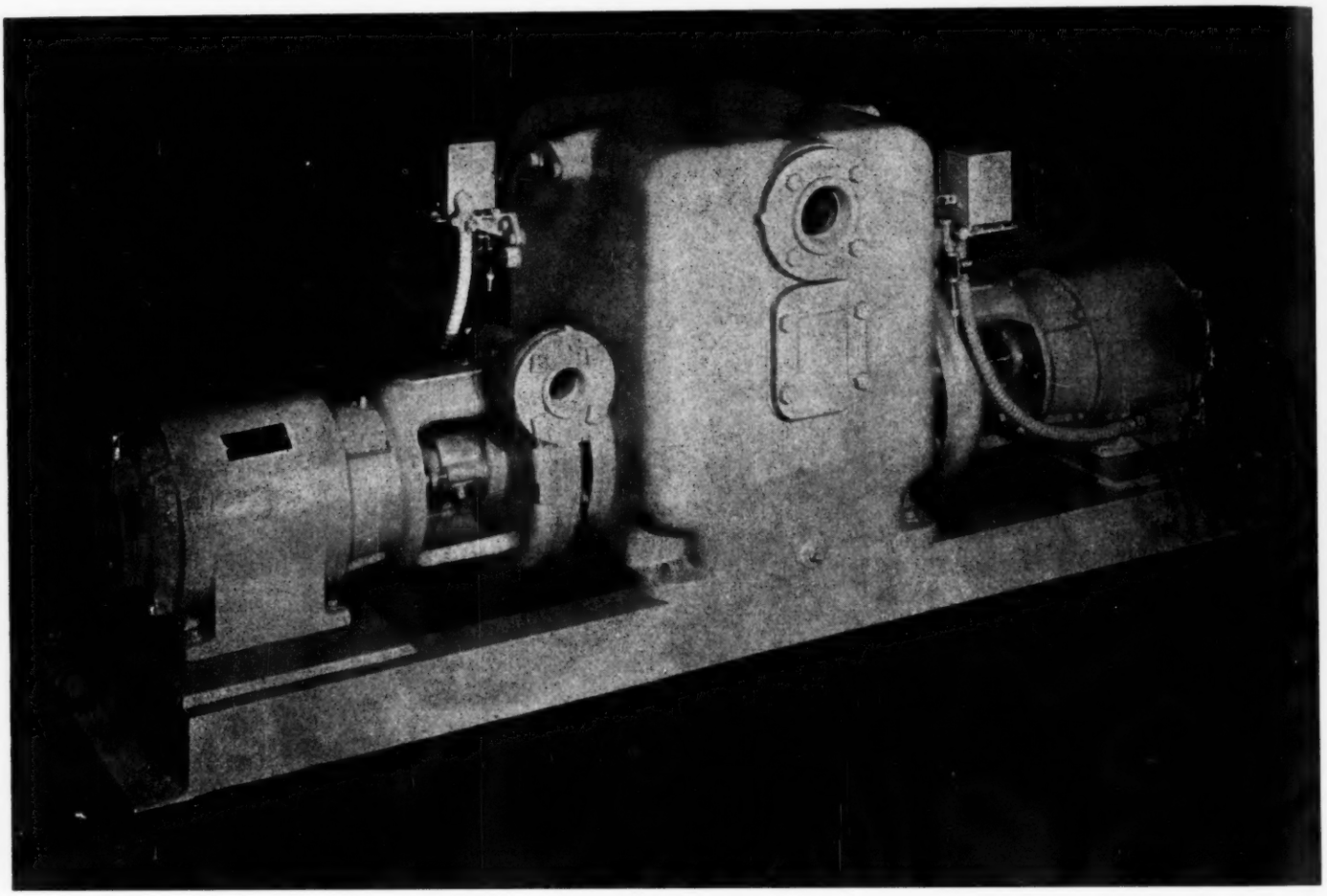

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Designed for steam systems on heating, drying, or process work, these pumps offer the most reliable and efficient means of returning hot condensate to boiler or hot well. In many cases these pumps will save costly installation of boilers in a pit to provide gravity flow of returns from basement radiators and heating devices.

The Jennings Condensation Pumps are sturdy and compact in construction, and combine receiving tank, pump and driving motor in a single assembly. Pumps are bronze fitted throughout, with tobin bronze shaft. The pumping impeller is of special design, made possible by our wide experience with return line heating pumps, and is especially adapted for handling hot water with the greatest possible efficiency.

Full automatic control is furnished by means of a ball float and float switch mechanism mounted on the receiving tank. All wiring is made up at the factory, and it is necessary only to connect the pump to the system and hook up the leads. Complete information regarding these economical pumps sent promptly on request.

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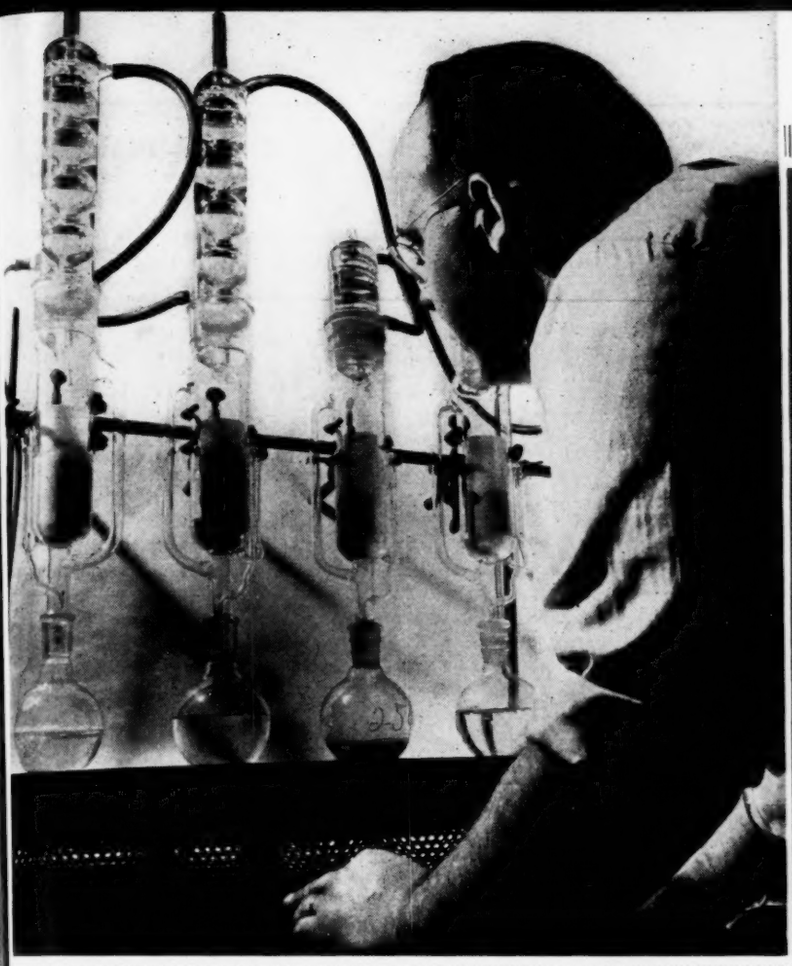


Calculation of Laboratory Cooling Loads

C. P. STOLBERG
Chief Mechanical Engineer
The H. K. Ferguson Co., Cleveland, Ohio

Determining cooling loads for research laboratories is a complex and difficult problem. The internal heat gain of most laboratories, particularly chemical laboratories, is relatively very high, due primarily to the heat emission of laboratory equipment and high concentration of people and lights. Determining laboratory heat gains bears very little resemblance to the problem of calculating normal building cooling loads. An example of laboratory load calculation is presented.

THE laboratory building heat gain, due to summer outside temperatures and sun loads, presents no difficulties and can be calculated in accordance with the normal procedures commonly used in air conditioning. It would normally be assumed that the load calculations for people and lights could also be carried out in the usual manner. Experience indicates, however, that this is not possible, and a complete study must be made to determine the average number of people occupying each laboratory unit during an average work day. Also, in an effort to reduce peak cooling loads, it is often necessary to make some compromise on the lighting by establishing a probability factor.

Determining the internal heat gain due to laboratory equipment presents the real problem in calculating total laboratory loads. It is a simple matter to count the amount of permanently installed laboratory equipment such as ovens, baths, hot plates and motors.

In addition to this type of equipment, however, most laboratories are furnished with portable equipment such as Bunsen burners, mantles, small furnaces, etc., which may be in use in one laboratory one day and in another laboratory the next day. The uncertainty of the amount of this movable equipment that will be in operation at any one time is, of course, due to the large variety of work performed in most laboratories, the character and volume of which may change daily.

The biggest difficulty, however, in determining actual laboratory cooling loads is the probability of use of each piece of equipment, or, in other words, the load factor. For example, a well-equipped laboratory will have as many as ten gas outlets for Bunsen burners. To assume that under maximum design conditions all ten burners will be in use at one time in every laboratory is impractical and would result in excessive cooling requirements beyond the scope of any reasonable air conditioning system. If you add to this Bunsen burner load all of the other cooling loads resulting from heat producing equipment that could possibly be in use at the same time, the total resulting cooling requirements are practically beyond the imagination. Somewhere between this point of simultaneous peaks and no load at all is a point that must be found, around which the air conditioning should be designed. This brings us face to face with the problem of how to determine the load factor and corresponding design point.

The best source of information for determining these load factors is an existing laboratory performing similar work. In most cases a new research laboratory is the result of the necessity for expansion, and conditions in existing units can be the test basis.

Table 1 illustrates an actual count of the number of heat producing pieces of equipment *in operation* in each of twenty-one existing laboratories on a particular day. The room numbers are arranged at the top

TABLE 1—LABORATORY EQUIPMENT IN USE

Date—July 14 Time—10:30 A. M.

Type of Equipment	Laboratory Room Nos.														
	101	103	106	107	108	109	110	202	204	212	213	301	302	304	306
	No. Pieces of Equipment in Use														
Dowtherm Converter					4		4	1							
Nichrome Converter	2							4	2						
Bunsen Burner					1					4		3	1	1	
Mantles			2	2	2	3	2	4							1
Hot Plate			1		1	1	1	1	1						1
Vacuum Pump Motors, HP	1/3		1/3		1/3	1/2		1/2		1/6			1/6		
Oven	1				1					1		1			
Furnace															
Heat Lamps								2	1						
Oxygen Gas Flame															
Hot Water Bath		1					1				1				
Variac	4		2	2	6	4	6	7	2	1					1
Miscellaneous Motors, HP	1/5				1/8										
Steam Equipment	1														

of the chart, and all of the heat producing pieces of equipment are listed vertically at the left. This is not a difficult count to make, as no Btu calculations are required, and any laboratory assistant can check one room and list the equipment in operation in about two minutes. It will be necessary, of course, first to make a complete list of all of the various kinds of heat producing equipment in use in the laboratory and make up a suitable form, such as that of Table 1, adapted to the particular laboratory being checked.

One day's check of the equipment in use is not sufficient and will not result in a dependable estimate of average conditions. As a general recommendation, it is felt that to obtain a reliable average cooling load estimate each room should be checked at least nine times, allowing approximately five to seven days between checks. The allowance of five to seven days between checks is important in order to allow sufficient time for the character of work in the laboratories to vary in accordance with ordinary work schedules. Some specific unit of laboratory work might last ten days, and, if checks were made on ten successive days, only one type of function would be recorded as the average.

If possible, the counts should be made during the summer months, not because of effect of the atmospheric conditions, but because the vacations of laboratory operating personnel normally occur in the summer and affect the volume of operations. This will tend to prevent the simultaneous peak of hot weather and maximum operations from affecting results.

Also, the checks should not be made on the same day of the week nor at the same hour of each day, as a Monday morning load will usually be considerably less than an afternoon load later in the week.

The next step is to determine the amount of heat emitted by each piece of equipment. In the case of motors this is, of course, a very simple proposition, but other laboratory items such as Dowtherm converters, Variacs and water baths are more difficult to calculate. Kilowatt consumption on electrical units usually can be taken directly from name plate ratings or very often can be obtained from the manufacturer's published data. In some cases it may be necessary to calculate the amount of steam consumed by steam heated equipment, and this can best be done by measuring and weighing the condensate. For all equipment, electrical or steam operated, the full heating capacity should be considered as being delivered to the room air even though the unit may be vented or hooded.

Bunsen burners are usually the largest contributors to the laboratory cooling load with possibly the exceptions of ovens and autoclaves. Electric heating by mantles has recently tended to replace some of the Bunsen burners for retort heating at substantial savings in the cooling load. To rate Bunsen burners, the maximum gas burning capacity must be obtained from the manufacturer's data, and it is recommended that 75% of the maximum rating be used as an average for calculating cooling loads. It should be remembered that the burning of gas, either natural or manufactured, produces considerable water vapor, as well as heat, resulting in an emission of latent heat in addition to the sensible heat. A very careful count of the Bunsen burners in operation is recommended.

Table 2 was obtained by multiplying the number of pieces of equipment in use, as indicated by Table 1, by the calculated Btu output for each piece of equipment. The heat loads were then totalized showing, for instance, that on July 14 room 212 had a total *internal equipment* heat gain of 24,900 Btu per hr.

TABLE 2—HEAT GAIN PER LABORATORY FOR SINGLE TEST HOUR ON JULY 14

Type of Equipment	Btu Per Hr Ea	Laboratory Room Nos.													
		101	103	106	107	108	109	110	202	204	212	213	301	302	304
		Btu Per Hour, in Thousands													
Dowtherm Converter	3400					13.6		13.6	3.4						
Nichrome Converter	3400	6.8							13.6	6.8					
Bunsen Burner	4000					4.0					16.0		12.0	4.0	4.0
Mantles	1700			3.4	3.4	3.4	5.1	3.4	6.8						
Hot Plate	2000			2.0		2.0	2.0	2.0	2.0	2.0					
Vac. Pump Motors, HP	3400 Per HP	2.4		2.4		2.4	5.1		5.1		.5			.5	
Oven	7526	7.5				7.5					7.5		7.5		
Furnace	3400														
Heat Lamps	1000								2.0	1.0					
Oxygen Gas Flame	4000														
Hot Water Bath	1000		1.0					1.0				1.02			
Variac	850	3.4		1.7	1.7	5.1	3.4	5.1	6.0	1.7	.9				
Miscellaneous Motors, HP	3400 Per HP	1.4				.4									
Steam Equipment	1000	1.0													
Equipment Total		22.5	1.0	9.5	5.1	38.4	15.6	25.1	38.9	11.5	24.9	1.02	19.5	4.5	4.0
Building Load Max.		2.2	2.2	2.2	4.4	2.2	4.4	2.2	1.8	1.8	3.7	1.8	2.4	2.5	4.2
People	600	1.2	.6	.6	1.8	.6	.6	1.2	1.2	.6	1.2	1.2	1.8	1.2	.6
Lights	900	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9
Total		26.8	4.7	13.2	12.2	42.1	21.5	29.4	42.8	14.8	30.7	4.9	24.6	9.1	9.7

To this equipment heat gain has been added the calculated building heat gain at the design conditions as well as the expected load due to people and lights. The variations in the building load are due to the various exposures of the different laboratories resulting in variations in the sun loads. The number of people in each laboratory may be actually counted or may be estimated with satisfactory results. Regarding the load due to lighting, the full capacity of the lighting system installed in each laboratory should be figured, for it has been fairly well determined that, due to the exacting nature of most laboratory experimental and testing operations, a high level of light is required at all times. Also, no method has yet been devised to induce laboratory technicians to turn off the lights when they are not needed.

Table 3 is a composite chart of total heat loads on nine representative days. From the information posted on this chart it is possible to obtain the average load for each particular laboratory extended over the number of tests made. As an example, room 212 has a nine day average load of 26,400 Btu per hr, whereas Table 2 shows that on July 14 the load was 30,700 Btu per hr. From this variance it can be seen that it is not at all safe just to use one check for determining the representative load. However, this average cooling load for

TABLE 3—SUMMARY OF LABORATORY HEAT GAINS ON NINE DAYS

Date	Laboratory Room Nos.														
	101	103	106	107	108	109	110	202	204	212	213	301	302	304	306
	Btu Per Hour, in Thousands														
June 22	20.4	4.7	11.1	15.6	34.1	17.4	37.1	34.3	15.0	19.8	23.1	12.0	12.1	18.8	8.6
June 30	20.5	4.7	11.1	12.3	43.0	18.2	32.6	33.4	15.6	28.8	14.4	16.7	15.5	5.7	8.6
July 6	16.4	4.7	7.4	12.3	47.1	14.2	40.7	35.5	14.5	20.0	14.4	16.7	11.5	5.7	8.6
July 11	27.0	4.7	6.8	19.1	32.1	23.7	33.7	23.3	18.9	28.3	10.1	20.7	9.1	11.2	11.2
July 14	26.8	4.7	13.2	12.2	42.1	21.5	29.4	42.8	14.8	30.7	4.9	24.6	9.1	9.7	11.5
July 19	17.4	13.6	12.9	17.9	37.1	19.4	28.3	43.1	15.3	22.3	6.4	12.7	24.1	10.9	8.9
July 22	21.6	3.7	8.0	12.2	37.5	17.7	33.9	34.3	28.1	33.6	14.0	25.3	22.6	14.6	7.4
July 28	20.9	11.9	13.1	17.9	26.8	22.2	36.1	46.2	11.2	24.6	9.5	23.7	10.0	18.3	10.0
August 10	30.7	15.6	8.6	13.3	53.8	28.1	29.2	30.1	26.3	29.4	20.1	27.7	17.8	26.5	5.7
Total	201.7	68.3	92.2	132.8	353.6	182.4	301.0	323.0	159.7	237.5	116.9	180.1	131.8	121.4	80.5
Average	22.4	7.6	10.2	14.8	39.3	20.3	33.4	35.9	17.8	26.4	13.0	20.0	14.6	13.5	8.9

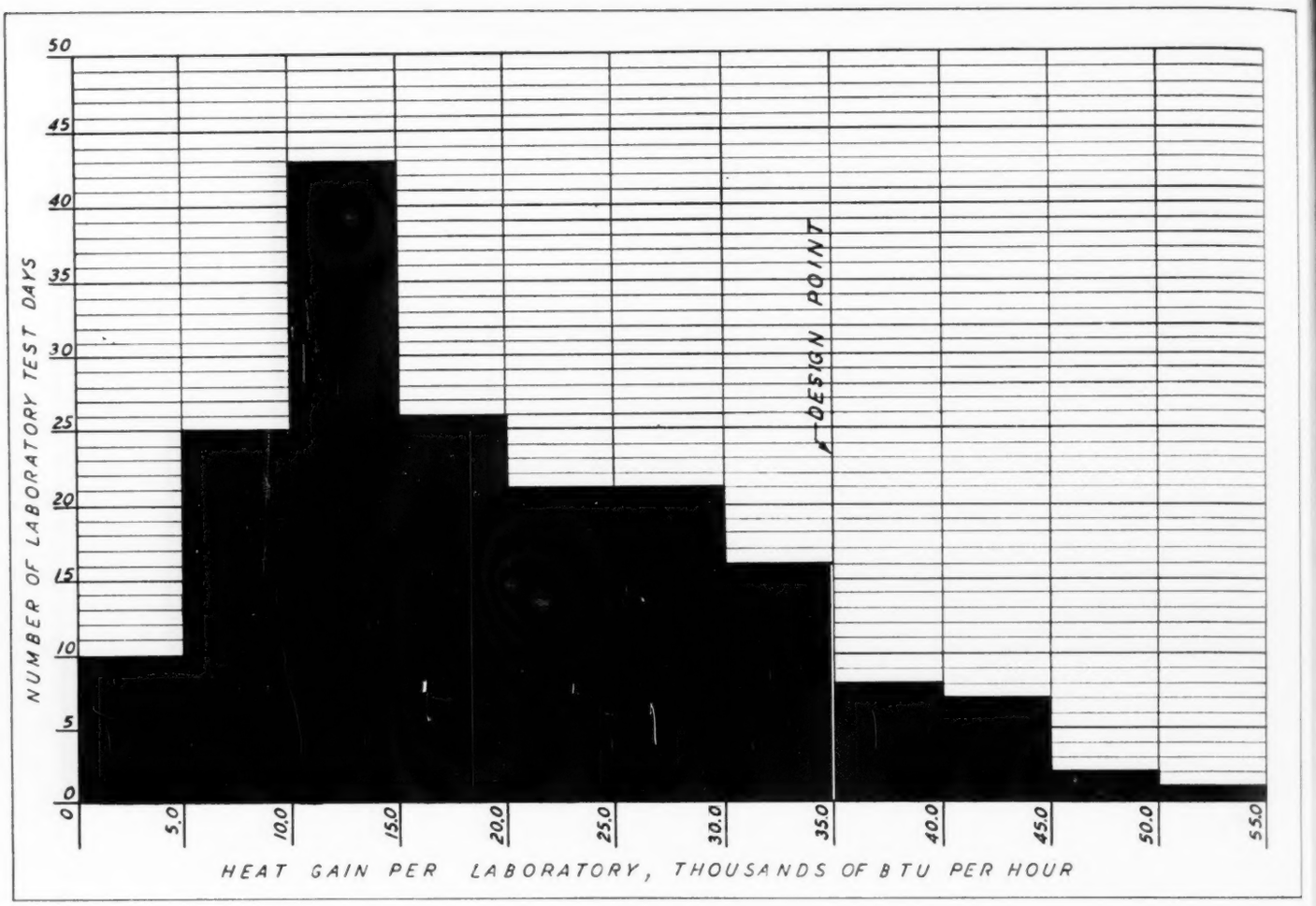


Fig. 1. Total number of test days requiring various amounts of cooling. Design point is set at 35,000 Btu per hr as handling 90% of test day loads.

any particular laboratory room is not an important figure and should be used only for comparative purposes and for obtaining a general picture of the conditions. The essential figures are the cooling loads for a particular laboratory on a particular day, and the accumulation of these daily figures for a number of rooms will determine the amount of cooling required.

Fig. 1 shows the total number of laboratory test days requiring a specific amount of cooling. Referring back to Table 3, it will be seen that the test results are based on twenty laboratories, each tested on nine days, which results in a total of one hundred and eighty laboratory test days. The area under the curve in Fig. 1 is equal to one hundred and eighty laboratory test days. Thus, for example, there were forty-three laboratory test days (out of one hundred and eighty) for which the cooling requirements were between 10,000 and 15,000 Btu per hr, and, similarly, there were only seven laboratory test days when the cooling requirements were between 40,000 and 45,000 Btu per hr.

A study of the chart readily indicates that it is not feasible nor reasonable to supply a cooling capacity of 55,000 Btu per hr for each laboratory as only one day out of the one hundred and eighty laboratory test days required that much cooling. A study of this particular chart would indicate that a design point of 35,000 Btu per hr should be established. This means that each laboratory will be supplied with sufficient cooling to handle a total gain of 35,000 Btu per hr.

The selection of this design point actually means that during any one hundred and eighty laboratory test days during the summer it is possible that eighteen laboratories, or 10% of the test days, will be undercooled. Such a compromise must be established and fully recognized by the laboratory operating personnel before the cooling equipment is selected and the cooling system designed. The selection of this design point may be determined by the critical nature of the work carried out in the laboratory, and, if it is absolutely impossible to have any rooms exceed the design room conditions, the full cooling capacity (which in this case is 55,000 Btu per hr per room) must be provided. However, these severe requirements are seldom, if ever, encountered.

It will be seen from the foregoing that this is not an exact theoretical science, but it is a semiscientific approach to a problem that cannot be solved theoretically. The heat gain design curve can be made very accurately, but the selection of the compromise point or design point must be tempered by judgment. It is generally felt that a cooling system for a laboratory should be installed to take care of approximately 90% of the cooling, resulting in having about 10% of the rooms occasionally undercooled. This undercooling will be due to the excessive internal gains caused by the extensive operation of laboratory equipment and may be somewhat controlled by regulation of laboratory operations.

Short Center Applications of V-Belt Drives

FRANK H. RUMBLE
Texrope Drive Department, Allis-Chalmers Manufacturing Co.

Among various advantages to the air conditioning and refrigeration industry in the use of the V-belt drive is its ability to operate on extremely short center distances. This feature is particularly desirable from the standpoint of economy and compactness.

USING the shortest practicable or ideal center distance on any V-belt drive lowers initial cost as well as maintenance cost. Short belts are lower in first cost and for replacements when they become necessary. They require less adjustment. It is also easier to maintain the proper tension on a short center drive since there is less belt to stretch and get out of adjustment.

Compactness and space saving alone, of course, can be solved by direct connection of the prime mover to the driven machine. However, this method of power transmission is practicable only when the speed of the driven machine need not be different than the speed of the motor or prime mover and where no shock load is present. In other words, another advantage of the V-belt drive, and one which works hand in hand with the short center feature, is that small or relatively large ratios—up to 7 to 1 and over—may be used to obtain the exact rpm desired in the driven machine. Furthermore, the resiliency of the V-belts themselves allows peak loads and heavy starting torque to be absorbed without transmitting shock to either the driving unit or the driven machine.

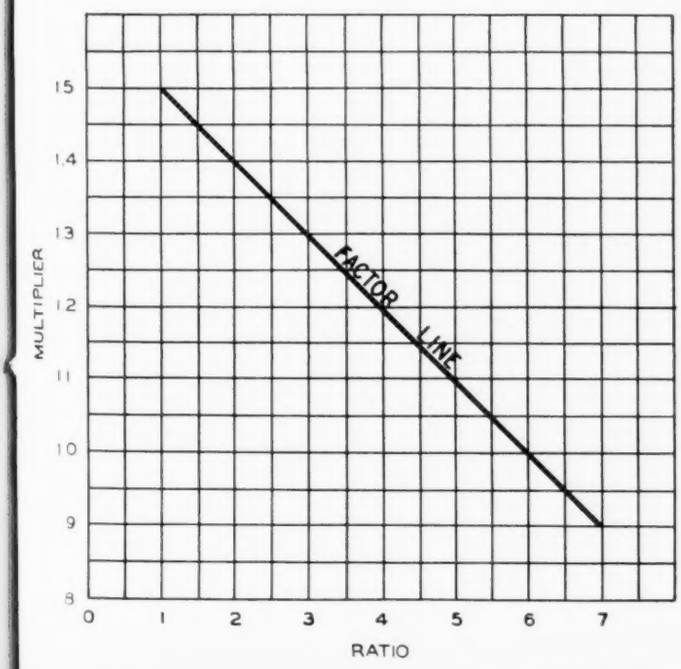


Fig. 1. Chart for determining ideal center distance.

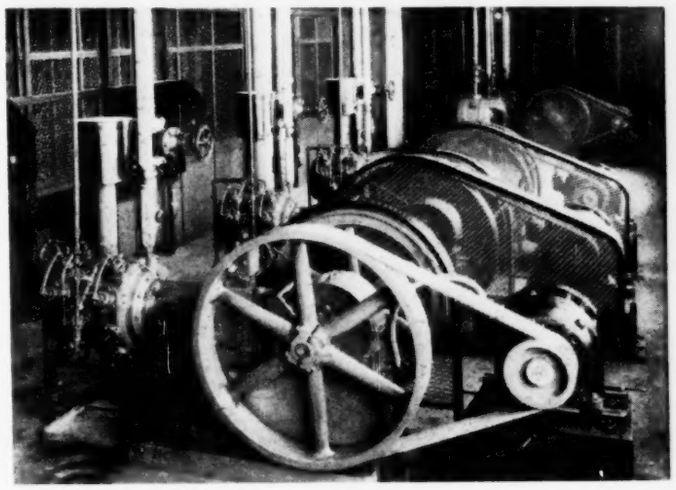


Fig. 2. Air compressors driven by short center V-belt drives on 20- and 30-hp motors.

In practice, the center distance—distance between shafts—of a V-belt drive may be comparatively long or it may be as short as diameters will allow without the sheaves actually touching each other. Experience has shown that the shortest *practicable* center distance is the sum of the radii of the sheaves plus enough margin to enable the sheaves to be moved toward each other sufficiently for installing or changing belts. A margin of anywhere from several inches on fractional horsepower drives to several feet on the largest multiple drives may be sufficient for this purpose. However, because it is not always possible or desirable to use the very shortest center distance, the designer is given some leeway.

Arc of contact of the belts on the sheaves must be taken into account to obtain the best drive with the fewest number of belts. For greatest operating efficiency, the arc on the smaller sheave should never be less than 90 degrees. Taking all of these factors into consideration, V-belt drive engineers are agreed that, as a general rule, the ideal center distance of the drive, up to 7 to 1 ratio, is from one to one and a half times the diameter of the large sheave. On larger ratio drives, the center distance may be slightly less than the diameter of the large sheave.

Fig. 1 is a chart which has been evolved for determining the ideal center distance proportionately. If the diameter of a driven sheave is 30 inches, it is

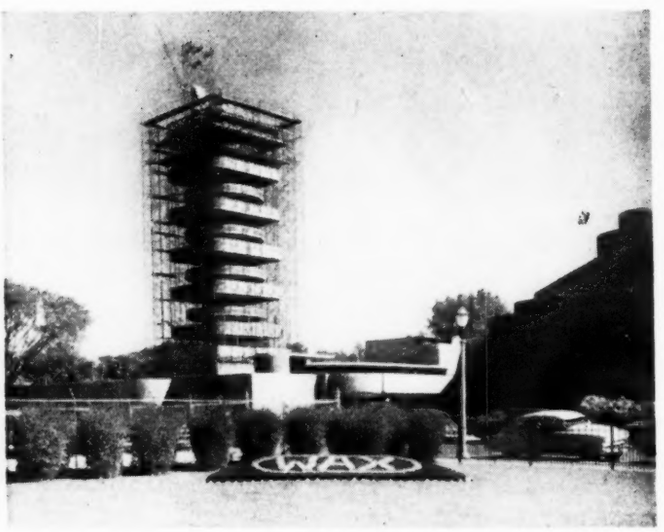
obvious that if the diameter of the driver sheave is also 30 inches, the center distance of the drive must be considerably more than 30 inches—the sum of the radii of the sheaves alone is 30 inches and in that space they could not be belted.

Note, however, that for 1 to 1 ratio drives, the rule allows a center distance of one and a half times the diameter of the driven sheave. In this case the ideal center distance would be 45 inches. If the diameter of the smaller or driver sheave is five inches, a 6 to 1 ratio drive, a multiplier of 1.0 times the diameter of the driven sheave shows the ideal center distance to be 30 inches. Similarly, the table can be used to determine the approximate multiplier for calculating the ideal center distance for drives of any ratio.

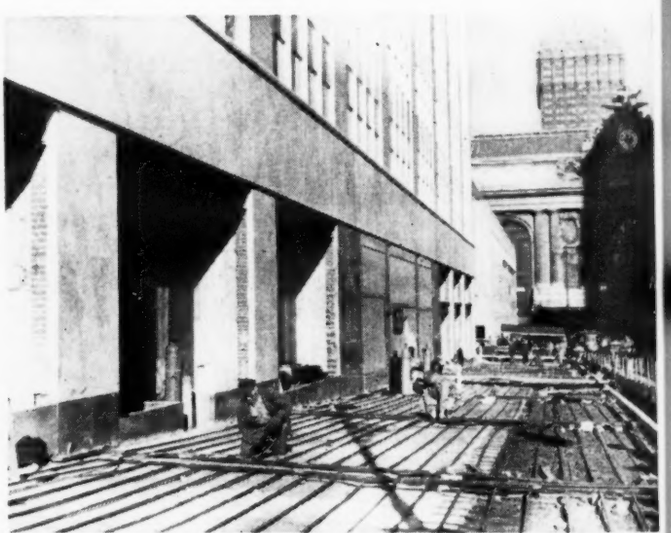
Many V-belt drives now operating satisfactorily have a longer center distance than is necessary, yet the longest centers found on V-belt drives are short when compared with flat or other types of belt drives.

To enable the engineer to design any drive with a center distance as near the ideal as possible, V-belt manufacturers have standardized on a considerable number of lengths in the five standard belt sizes (A, B, C, D, and E sections). It is usually possible to select stock belts and sheaves, and by varying the size of the sheaves while keeping the same ratio, to obtain almost the exact center distance desired. This must be, and can be done without violating any of the basic principles of good V-belt engineering, such as recommendations concerning minimum sheave diameters or excessive belt velocity. Use of the short center is very desirable, but it should not, and need not, be attained at the sacrifice of efficiency and long life of the drive. It is possible to have all three.

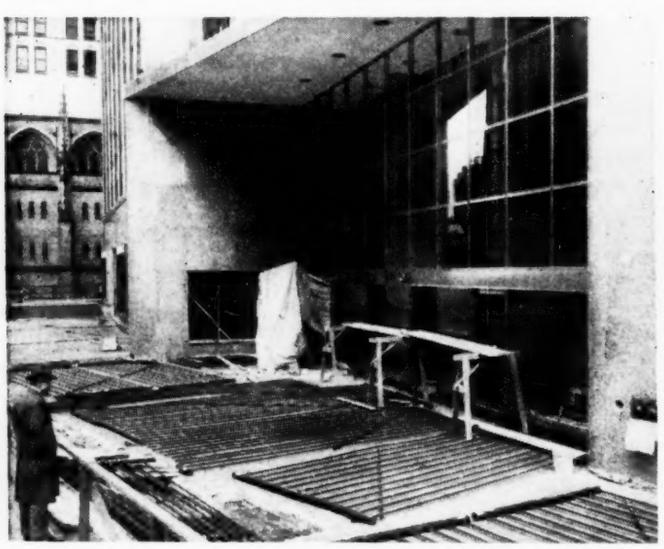
Picture Paragraphs



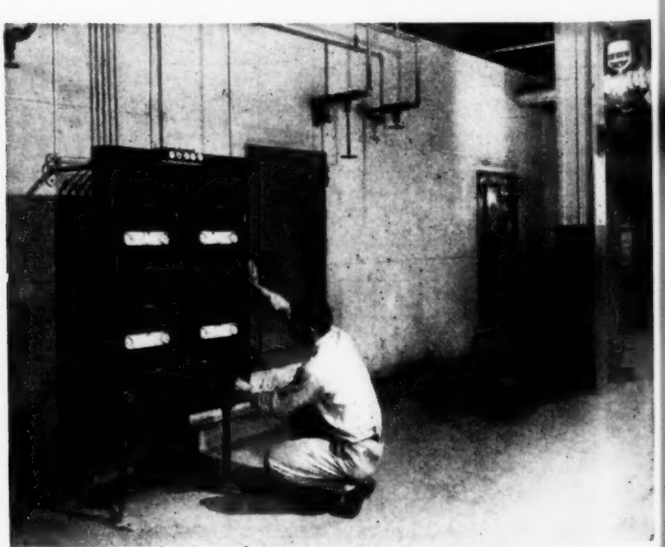
Frank Lloyd Wright's Johnson Wax Research Tower nears completion at Racine. Double glass walls enclose concrete core, air conditioned and radiant heated.



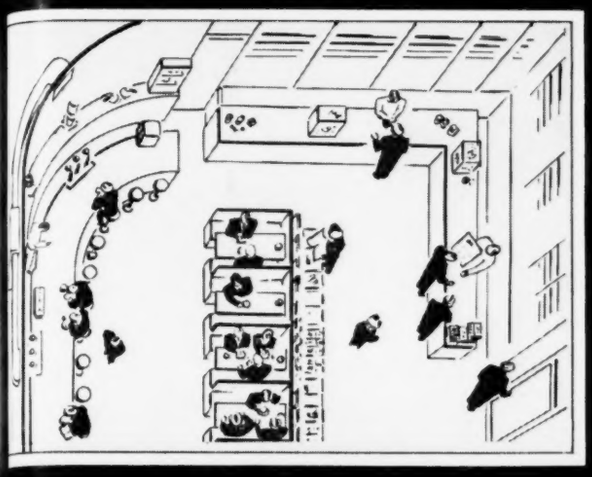
100 Park Ave., New York City, gets 10,000 sq ft of snow melting sidewalk with 9,000 ft of welded steel pipe in coils. Water and antifreeze will be heated by steam to 180F.

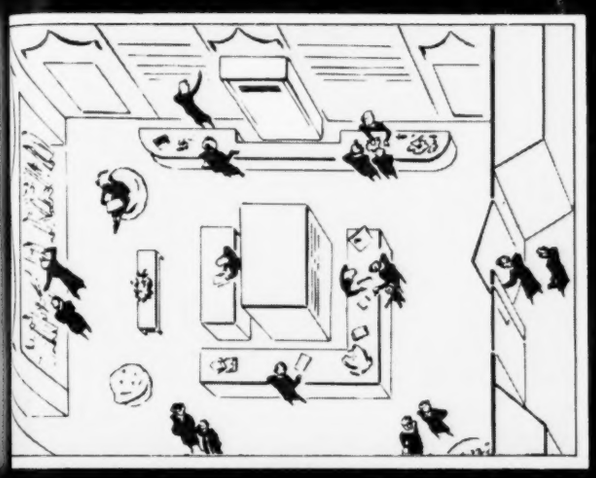


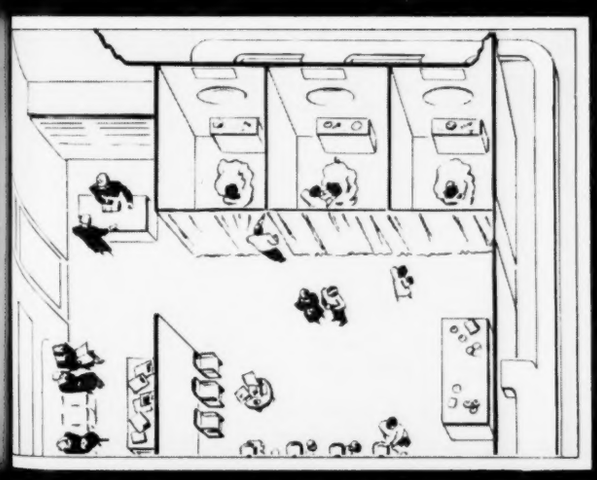
Snow melting system for New York's Mutual Life Building covers 12,000 sq ft of sidewalk with 14,000 ft of Rayduct steel pipe. District steam will heat water and glycol medium.

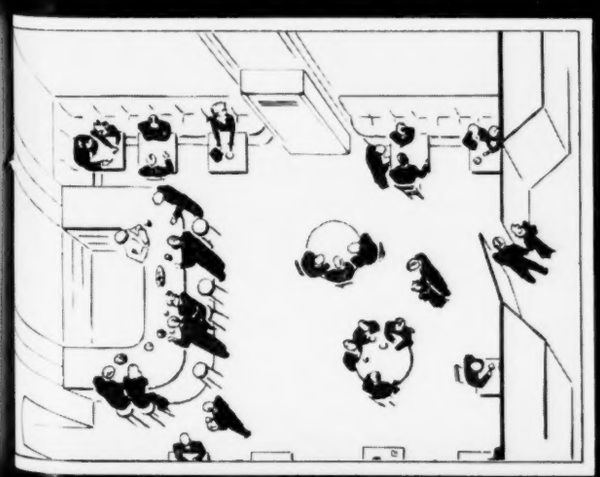


Insulated boxes are built around refrigeration units of a Midwest engine research laboratory to eliminate separate insulation of individual equipment. Block mineral wool chamber is simpler.









Air Conditioning Retail Stores with Self-Contained Units

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Bloomfield, N. J.

Air Conditioning Retail Stores with Self-Contained Units

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New design and installation concepts, different from the ones associated with central air conditioning systems, have been developed for the self-contained units for air conditioning stores and commercial spaces of comparable size. Data are presented of value to the design and installation engineer.

BOTH from the standpoint of the prospective owner, who in most instances does not feel that he can afford the expense or loss of time involved in a custom-designed central plant installation, and from the standpoint of the manufacturer, who by packaging components is able to assure more complete satisfaction, the store cooler or self-contained air conditioning unit has provided the best answer to the problem of simple, quick and inexpensive installation.

Units come from the manufacturer with all refrigerant piping in place and connected; refrigerant and oil charges in the units; internal wiring between compressor and fan motors, thermostat and other controls installed. By simply bringing a source of power to these machines, providing for cooling water supply and return, and supplying a drain connection for the condensate, the units can be placed in operating order. While some installations may require a more elaborate air distributing system (which will be covered later on), nevertheless, a great many satisfactory installations have been made with no more trouble or expense to the owner than that described.

Contrast this extreme "plug-in" installation simplicity with the connection and testing of the many components that go to make up even the most elementary central plant system, together with the ductwork involved, and it becomes evident why the packaged air conditioner enjoys such favor.

Floor Space

Floor space requirements for the most popular units, the 3 hp and 5 hp store coolers, have been reduced to the point where they require only about 5¾ and 7 sq ft, on the average. With floor area requirements as

*Application Engineer.
†Commercial Engineer.

modest as these, it is the extreme case indeed where space cannot be found for the unit. Although in some instances the available space does not represent the best possible location for the unit, comfortable conditions in all parts of the area may nevertheless be obtained by judicious direction of the leaving air stream, or by use of short ducts.

Flexibility and Appearance

While the least expensive and simplest application of the packaged air conditioner, as well as the most common one, is against a wall in the space to be conditioned, installations are frequently made which call for the unit to be placed in a closet or other adjoining space, air being delivered to the conditioned area by short duct runs.

Packaged air conditioners must present an attractive appearance, since the most frequent application of these units is within the conditioned space itself, and usually in plain view of everyone.

Adequate Air Distribution

The problem of adequate air distribution from the unit, combined with the problem of minimum floor area, has accounted for the particular configuration of the store cooler as it exists today. People enjoy cool air in hot weather, but they definitely object to a blast of cool air directed at their ankles, knees, necks or heads. The high point of air discharge of the packaged air conditioner suits this requirement admirably, projecting the stream of cool air over the heads of nearby occupants, into the room where it diffuses gently downward by gravity. Air "throws" of considerable distance can be achieved in narrow spaces, as well as fan-like distribution patterns for wider and less lengthy spaces, by proper adjustment of the air outlet louvers.

Where ducts are required, they are led from the air discharge plenum of the unit and run along the ceiling, out of the way, to the spaces desired.

Range of Sizes

By standardizing on a few, mass-produced self-contained models, manufacturers of packaged air conditioners have brought the cost of air conditioning down to a level that is attractive to the small store owner. The most common unit sizes are 2, 3, 5, 7½ and 10 hp, delivering on the average approximately one ton of air conditioning per horsepower. Added capacity can be obtained by the use of more than one unit.

When necessary, relocation of the unit is easily accomplished. Simple water plumbing and power leads are generally all that are required.

Estimating the Load

There are a number of quick-estimate load calculation forms and methods in everyday use. Simplicity has accounted for their great popularity among dealers and distributors of packaged air conditioners. Almost every manufacturer of self-contained units has a short form heat gain calculation method. Usually it is a single sheet on which all the factors normally considered in a heat gain calculation are shown in condensed form.

Some manufacturers have published short form sheets covering a number of specialized applications; for example, one form is available for retail stores, another for bowling alleys, and so on. One of the best of the short form calculation methods available today is the ACRMA Cooling Load Estimate Form for Self-Contained Air Conditioners, available through the Air Conditioning and Refrigerating Machinery Association, Inc., Washington, D. C.

While in nine out of ten cases, the short form method will result in the correct load calculation, it is the tenth job that has those unusual, out-of-the-ordinary conditions, and it is the one that causes so much grief. Don't trust too much to the short form methods until experience has indicated that they can be relied upon for any specific instance. And when in doubt, check the load calculations with the more rigorous methods. In the hands of experienced individuals, the short form methods are quite adequate and accurate, but there are opportunities to go astray.

Many times, the customer would like to have a rough, on-the-spot estimate of just how much air conditioning he needs for his establishment. For supplying reasonably accurate answers to these requests for quick estimates, manufacturers have developed rough, rule-of-thumb guides.

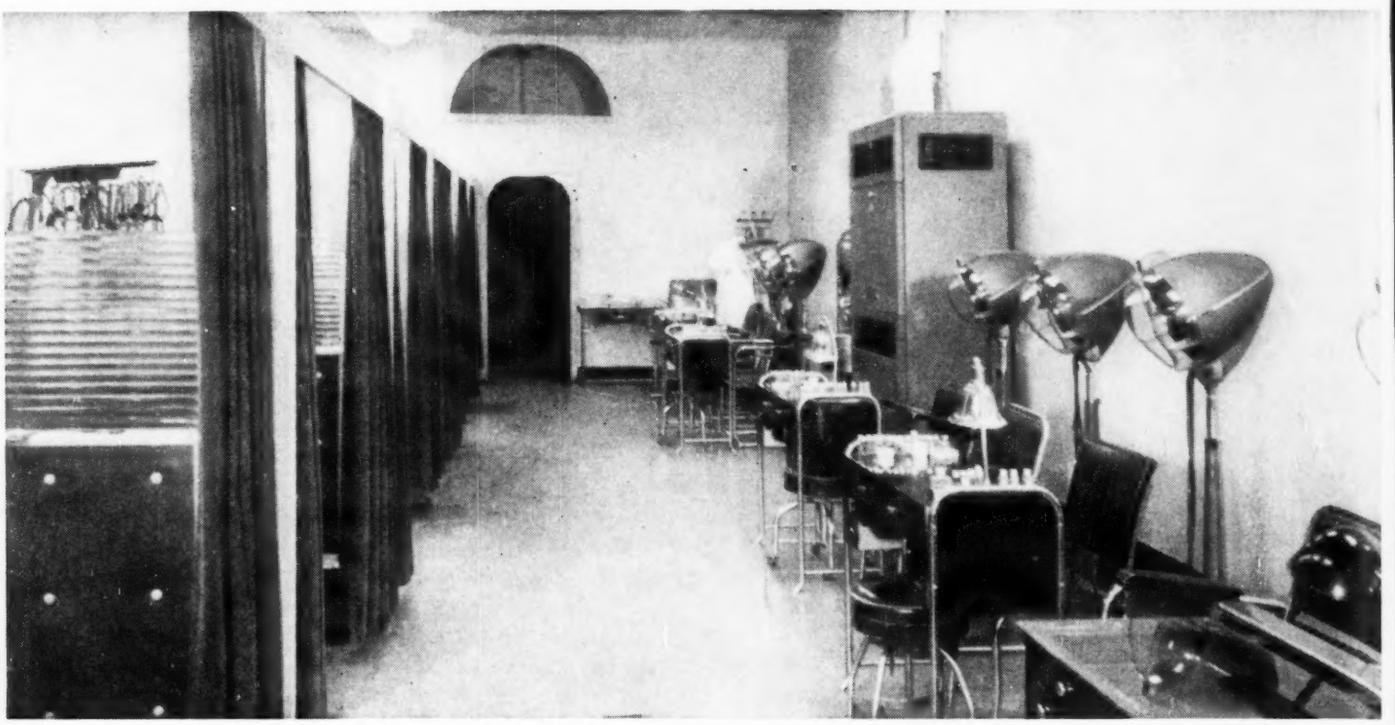
It should be understood that the figures of Table 1 used by the General Electric Co. are never employed as a substitute for an accurate heat gain calculation, but only to give a quick estimate of the approximate cooling load of a building or space. They give the load figures for packaged air conditioners.

TABLE 1—QUICK ESTIMATE LOAD FIGURES FOR PACKAGED UNITS

Banks—300 sq ft per ton
Barber Shops—250 to 300 sq ft per ton
Bars and Taverns—8 seats per ton
Beauty Shops—2 booths per ton
Department Stores:
  Main Floor—150 to 200 sq ft per ton
  Upper Floors—200 to 350 sq ft per ton
Dress Shops—150 to 350 sq ft per ton
Drug Stores—150 to 315 sq ft per ton
Funeral Parlors—300 to 400 sq ft per ton
Grocery Stores and Supermarkets—300 to 400 sq ft per ton
Night Clubs—8 seats per ton
Offices:
  Multi-Story Buildings—400 to 500 sq ft per ton
  Single Floor—350 to 400 sq ft per ton
  Top Floor—250 to 300 sq ft per ton
Restaurants:
  Restaurants—10 to 12 seats per ton
  Cafeteria—8 seats per ton
  Hotel Dining Room—12 seats per ton
Shoe Shops—160 to 350 sq ft per ton
Theaters—15 to 20 seats per ton

Unless otherwise noted, all tables in this article were developed by the General Electric Co., Air Conditioning Department.

These figures, when combined with the known cost per ton of installed air conditioning in a specific area, will help one to make a quick cost estimate of the job.



One of the methods for employing a packaged air conditioner to serve a beauty parlor.

Load Calculations

Although short form methods may be used for estimating purposes, in the interest of good installations and satisfied customers, more accurate methods should be used in the final analysis. It is important to consider separately each area to be conditioned, omitting infiltration if adequate ventilation is to be provided for the system as a whole.

The reference section in the August, 1949, issue of HEATING AND VENTILATING, gives complete details on load calculations. There are numerous other detailed load calculation methods available which may be used with equal success.

The method employed should consider each portion of the heat gain separately. In other words, the wall, ceiling, floor, glass, ventilation, solar heat gain, occupancy, and internal loads must be calculated independently. Each component of the heat gain should be analyzed with the thought that it may be more economical to reduce the load by the use of awnings, blinds, insulation, or properly located exhaust fans rather than to install the cooling capacity indicated by the initial calculation.

In this article it is assumed that the conduction and solar load have been carefully calculated, taking into consideration the effect of varying solar loads due to the time of the day and whatever effect the time lag will have in the over-all analysis. The ventilation load and the occupancy load, as well as a portion of the internal load, will be discussed briefly as the approach is somewhat different than for a large central plant air conditioning system.

In some cases, natural infiltration will be the only source of ventilation air. Should duct work be employed in such cases, somewhat larger ducts are needed from the packaged air conditioner to the room grilles. In some instances, increases in the duct and grille sizes required to overcome the natural infiltration load actually cost more installed than the small fresh air duct that could be used. When natural infiltration alone is to be considered, the air changes per hour may be determined from Table 2 which indicates a varying amount of fresh air, depending upon the number of sides of a room which are exposed.

When a fresh air duct is provided, the area is kept under a slight pressure. The ventilation air requirement depends on the occupancy of the entire conditioned space and is not necessarily the summation of the peak ventilation load in the individual room. Only where the natural infiltration exceeds the ventilation air supplied, need any portion of the infiltration be considered in the individual room load. Table 2 gives recommended ventilation air standards depending upon the smoking anticipated within the area. Table 3 is more complete and gives the minimum and recom-

TABLE 2—VENTILATION AND INFILTRATION*

Ventilation Requirements				Infiltration†
Smoking	No. of Occupants	Factor	CFM	H = room height, L = length W = width, G = wall factor Room with one outside wall, G = 1 Two outside walls, G = 1.5 Three or more outside walls, G = 2
None		× 7½ =	.....	$CFM = \frac{HLWG}{60}$
Light		× 15 =	.....	
Heavy		× 40 =	.....	

*Used by courtesy of Air Conditioning & Refrigerating Machinery Association, Inc., Southern Building, Washington 5, D. C.

†For rooms with weatherstripped windows or storm sash, use 50% of this value.

mended ventilation air requirements for various types of applications.

The internal load consists of people, food, motors, electric appliances, gas appliances, steam appliances, as well as lights, whether they be fluorescent or incandescent. In reality, in the case of fluorescent lights, the power input to the fixtures, not the wattage rating of the lights, should be used as a criterion. In many cases, exhaust hoods or properly located exhaust fans will effectively tend to reduce appreciably the internal load. A careful analysis will often bring out convenient methods of reducing the owning-cost of air conditioning.

TABLE 3—VENTILATION AIR STANDARDS

Application	CFM Per Person		Per cent of People Assumed Smoking
	Recommended	Minimum	
Apartments	15	10*	Some
Art Galleries	1 change per hr	1 change per hr	None
Assembly Rooms	10	5	None
Banks	1 change per hr	1 change per hr	Occasional
Barber Shops	15	7	Occasional
Beauty Parlors	15	7	Occasional
Cafeterias	15	10	Occasional
Cigar Stores	15	7	Occasional
Cocktail Bars	20	10	30%
Coffee Shops	15	7	Occasional
Dance Halls	20	10	Occasional
Department Stores	7	5	None
Drug Stores	15	7	Occasional
Funeral Parlors	10	5	None
Hotel Rooms	15	10*	Some
Offices, General	15	10	Some
Offices, Directors' Rooms	30	20	80%
Offices, Private	30	15*	50%
Pool Rooms	20	10	50%
Pressing Establishments	20	10	None
Residences	Use actual infiltration	Use actual infiltration	Some
Restaurants	15	12	25%
Shops, Retail	10	7	None
Theaters	7½	5	None

*Figure at least 5 persons for a single medium sized room and 8 persons for a larger room, but do not pyramid such loads for multiple rooms beyond the maximum simultaneous peak.

Regardless of the cfm per person recommended, the ventilation air quantity should not be less than natural infiltration through windows, doors, and cracks.

The above values are given as a guide. The customer's wishes regarding ventilation should always be given serious consideration.

Internal Load of Restaurants

No discussion of ventilation air and internal loads would be complete without a brief discussion of this problem in a short-order restaurant, or a "diner" as they are referred to in the East. Most diners have a kitchen at the back and short-order trays in the front, consisting of coffee urns, bun warmers, toasters, steam tables, and the like. The high short duration occupancy loads of such establishments require considerable ventilation air.

The first requirements of a good application in a diner is the installation of adequate exhaust hoods over the appliances in the diner section to reduce the load. A positive supply of ventilation air must be provided to the diner section and the air flow through the exhaust hoods should be known. The balance of the ventilation air should be exhausted through the kitchen in order to somewhat reduce the temperature in that area. Exhaust fans of known air flow must be provided in the kitchen. In addition, a fresh air intake fan must also be installed in the kitchen so that a definite positive amount of air from the diner portion to the kitchen can be maintained. The air must flow from the dining portion to the kitchen to avoid kitchen heat and kitchen odors entering the dining section. In this way, the ventilation load on the air conditioner can be maintained fairly constant and the load not increased by undue infiltration.

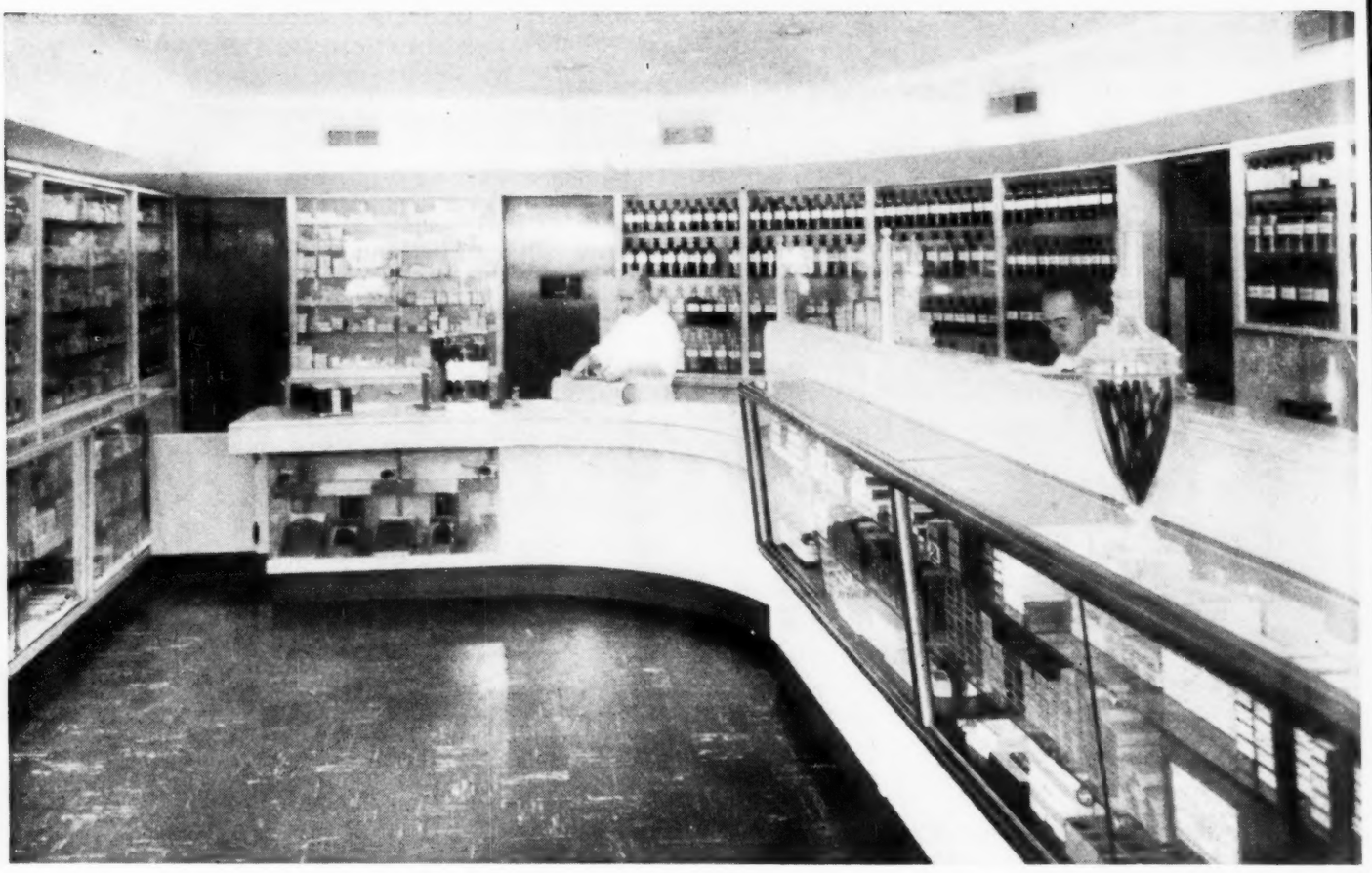
In diner applications it is desirable to keep all loads to a minimum, as nearly all of the internal loads are of short duration and normally occur at the time of the peak solar load. All these things tend to increase the installed capacity and usually the expense of such an installation cannot be justified. In addition, there are limitations to the amount of capacity that can be installed in a given area as when the load is very large for the conditioned volume, and the number of total air changes in the space (recirculation plus ventilation air) soon approaches the maximum which is considered in the comfort range.

The system should be designed for not over 30 air changes per hour nor more than a 25F drop across the cooling coil. Any excess of 30 air changes causes undesirable drafts and an increase in the temperature drop across the coil is uneconomical as well as being objectionable from the standpoint of cold air blowing on the customers. Ventilation air and internal loads must be carefully controlled in order to adhere to these limitations. For such an application, little can be learned from most short form methods that are in use.

The number of persons to normally occupy the space after air conditioning is installed should be carefully estimated. If the people are engaged in the same activity, the bodies dissipate about the same amount of heat. If some are more actively engaged than others, this should also be taken into consideration in the heat gain calculation. If the occupancy is such that a large number of people are present for only a few minutes duration and a smaller number during the balance of the day, it is well to consider that the load will be the largest number which will be present for a duration of more than 15 minutes. This should not be considered as an individual occupancy of 15 minutes but a summation of peak conditions for 15 minutes.

Winter Heating

With packaged air conditioners, provision often must be made for winter heating. On most packaged air conditioners, three tons and larger, facilities are provided for installing heating or tempering hot water or steam coils. If existing steam radiation is to be removed and replaced by a heating coil in the packaged air conditioner, the adequacy of the coil should be checked by determining the square feet of radiation to be removed and multiplying it by 240, to determine



Simple duct work is installed in this drug store to distribute the conditioned air.

the required Btu per hour from the conditioner. In the case of a new structure, a heat loss calculation should be made. The heating coil capacity should be equal to or greater than the total heating load.

If more than one area is being considered, the total heat load would be the summation of the heating loads of the individual areas. The heat load may be determined by standard calculations.

Occasionally, the existing building heating equipment will be used for supplying the major heat in the area and the packaged air conditioner heating coil is used only for tempering the ventilation air. The required tempering coil capacity may be calculated from the following formula:

Coil capacity = CFM $\times$ 1.1 $\times$ A

Where

CFM = the cubic feet of air per minute to be warmed in the wintertime, usually from 50 to 100 per cent of the ventilation air used in determining the cooling load.

A = 45F minus the mean recorded outdoor temperature in winter. For example, if the mean recorded outdoor temperature in the locality is —10F, then A = 45 minus (—10) or 55F. In other words, for temperatures below zero, the difference is determined by adding the mean outdoor temperature to 45. For mean temperatures above zero, the difference is determined by subtraction.

Normally, packaged air conditioners are installed to operate with 20 to 30 per cent fresh air during the summer months. This quantity is usually cut in half by dampering for wintertime operation. With the wintertime quantity of fresh air as 10 to 15 per cent, standard steam coils will be suitable for heating or tempering. However, if the ventilation air quantity is increased to 30 per cent of the total air supplied by the air conditioner, and if the mean recorded outdoor temperature is below —20F, a special freeze-resisting type steam coil will be required.

Many times a packaged air conditioner will be installed in parallel with a warm air furnace. This is particularly true with 2-ton units where the space limitations have made it necessary to make no provision for steam or hot water coils. Also, in existing buildings where warm air furnaces are already installed, parallel ducts with suitable dampers for winter and summer change-over may be used with good results. This system of installation has found excellent acceptance in residential year-round air conditioning.

Zoning

Any system, large or small, is improved by proper zoning. The accuracy in the selection of the zones governs the resulting degree of satisfaction. There should, however, be a minimum number of zones for low cost and simplified control.

The proper zoning is determined in part by the exposure and in part by the usage of the area. Typical exposure variations requiring separate zones in the same building are:

(1) Corner space—two exposures.

(2) Group of areas located on the same side of the building, with one wall exposed.
(3) Inside rooms with no exposed walls.
(4) Areas below grade.
(5) Penthouse.
(6) Areas with large skylights and poorly insulated ceilings.
(7) Open areas more than 100 ft on a side.

Rooms with large windows exposed to the sun should not be zoned with rooms having smaller windows or no windows on the same side of the building.

In general, areas having two sides exposed should not be zoned with those having one side exposed. Similarly, areas with three sides exposed should not be zoned with those having two sides exposed.

The shading factor of adjacent buildings which varies throughout the day should also be taken into consideration.

Frequently, multi-story buildings are zoned floor by floor. This is generally not as good as the procedures discussed, but if low partitions are provided throughout, it may work out very well. With ceiling-high partitions, floor by floor zoning is not recommended.

The usage of an area should also be considered in the zoning, as areas of different usage have different internal loads despite the fact that the solar and conduction load of two areas may be similar. Areas such as the following should be zoned separately:

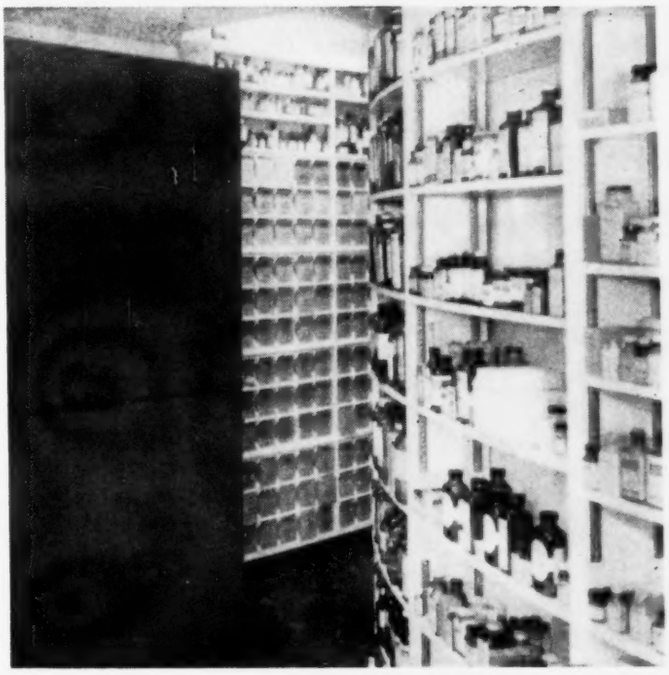
(1) Restaurants.
(2) Theaters.
(3) Furniture stores.
(4) Dress shops.
(5) Cigar or drug stores.
(6) Conference rooms and executive offices where groups gather for small business meetings.

In air conditioning a series of stores, it is generally desirable to put each on a separate zone, particularly if more than one tenant is involved. Occasionally, however, if it is anticipated that two adjacent stores will have the same or nearly the same internal and occupant load, they may be included in the same zone. This should not be considered if there is much possibility of a change in the store occupancy which would result in a change in the occupancy load.

A building cannot be zoned arbitrarily. Consideration must be given to all of the factors mentioned if it is to perform properly. This indicates a definite desirability for the use of packaged units in a series of stores or offices, so that greater flexibility and more simplified control can be provided.

Combination of Units

After zoning has been established, it may be found that there are advantages in the use of several units of lesser capacity. Perhaps the use of a 2-, 3-, and a 5-ton unit instead of one 10-ton unit will justify the additional expense. Simplified duct work, along with a reduced amount of cutting and patching, will often more than make up for the higher equipment cost of the multiple system. In many instances, no duct work will be required if smaller units are used in each conditioned area. This must be contrasted with the use of one large unit with duct work to connect it to the various conditioned areas. Recently, a department store in Detroit installed 18 small units on one floor rather than a large central system or several packaged air conditioners of a larger size with duct work.



A self-contained unit, placed in a corner of a storage area, serves the store illustrated on page 80.

Spot cooling does offer many advantages and reduces the operating cost. It enables all individual areas to be held at the desired temperature rather than allow various sections to drift and to be over-cooled. Unit sizes are governed by room dimensions, usage conditions, as well as zoning.

Packaged air conditioners can be effectively used to air condition any area where the load does not exceed their capacity. If ceilings are low, however, and long air throws cannot be tolerated due to the drafty conditions that might prevail, several small units may be used, or duct work installation may be required instead of a single larger unit. For long runs, duct work will conveniently distribute the air without causing drafts.

Packaged air conditioners of 2-, 3-, and 5-ton sizes are usually equipped with outlet grilles which have fully adjustable horizontal louvers and vertical vanes. Provision has also been made on nearly all packaged air conditioners for the addition of duct work, if the standard outlet grilles are not used. Generally speaking, when the units are installed without ducts, they should be located to throw the air the long way of the room.

Air Movement

Where possible, packaged air conditioners should be placed so that the outlet grille can throw air towards entrances to the conditioned area. The fully adjustable standard grilles supplied with most units will allow for wide angle air dispersion at short throw or narrow angle air dispersion at long throw. Throw is the distance from the supply grille to the nearest opposing wall which is high enough to block the air stream.

TABLE 4—DUCT SIZE SELECTION CHART

Pressure Drop = 0.1 Inch Water per 100 Equivalent Feet of Duct

CFM	Duct Size, Inches	CFM	Duct Size, Inches	CFM	Duct Size, Inches
50	4 × 6	1,100	8 × 22	3,100	12 × 34
100	4 × 8	1,200	8 × 24	3,200	12 × 36
150	4 × 10	1,300	8 × 24	3,300	12 × 36
200	6 × 10	1,400	10 × 22	3,400	14 × 32
250	6 × 10	1,500	10 × 22	3,500	14 × 32
300	6 × 12	1,600	10 × 24	3,600	14 × 32
350	6 × 14	1,700	10 × 24	3,700	14 × 32
400	6 × 14	1,800	10 × 26	3,800	14 × 32
450	6 × 16	1,900	10 × 28	3,900	14 × 34
500	6 × 16	2,000	10 × 28	4,000	14 × 34
550	6 × 18	2,100	10 × 30	4,100	14 × 34
600	6 × 18	2,200	10 × 30	4,200	14 × 36
650	8 × 14	2,300	12 × 26	4,300	14 × 36
700	8 × 16	2,400	12 × 28	4,400	14 × 38
750	8 × 16	2,500	12 × 28	4,500	14 × 38
800	8 × 18	2,600	12 × 30	4,600	14 × 38
850	8 × 18	2,700	12 × 30	4,700	14 × 38
900	8 × 20	2,800	12 × 32	4,900	14 × 40
1,000	8 × 22	3,000	12 × 34	5,000	14 × 40

While air velocities are considerably greater with the long throw adjustment, high air velocities are apt to cause drafty conditions. Rooms with high ceilings, where the air can be directed upward, are quite adaptable for long throws, since the air velocity is reduced considerably before the air falls to a level where it can be felt by occupants of the conditioned space. Normally, throws of between 18 and 60 ft are possible with packaged air conditioners by proper adjustment of the louvers, vanes, and fan speed.

Low air motion is desirable where people are seated for long periods of time, such as in business offices and the best type restaurants. Higher air motions are permissible in spaces where people are standing or moving about, such as in retail stores, bus stations, or hallways. This consideration will often affect the selection of the grilles and the location of the units for suitable air throw and air turbulence.

Reducing the fan speed of packaged air conditioners will reduce the total quantity of air handled. It will also reduce the air flow. It will increase the dehumidification effect slightly, while at the same time decreasing the sensible cooling effect. Air noise will be somewhat reduced. In areas where the major load consists of people, cooking, and a large ventilation air ratio, improved performance will result with reduced fan speed. If the sensible load, however, is sufficiently great so that excess dry bulb temperatures result, maximum fan speed and reduction of the percentage of fresh air will usually make for greater customer satisfaction. Although nearly all packaged units are equipped with adjustable motor pulleys for varying the fan speed, in most cases the fan speed will not have to be changed from the factory setting.

Duct Work

Duct work, which is generally not installed for the smaller units, is frequently desirable for the larger size units. After the unit selection and location have been determined, the question as to the need for duct work is also answered. For any sizable system, ducts should be designed in accordance with accepted practice.

Where adequate ventilation air is not supplied by infiltration, it is recommended that the packaged air conditioners have a ventilation air duct. The ventilation air quantity should be selected to match the job requirements. Twenty to thirty per cent ventilation air is usually adequate for the cooling system. The ventilation air intake should be located at a cool, clean, and odor-free side of the building. The ventilation supply louver should have adequate screening protection to prevent birds and insects from entering the air conditioner, and should be equipped with drip ledges, rain stops, and suitable drains.

When it is determined that an installation will have duct work, duct sizes may be selected from Table 4. If any duct must have dimensions other than those given in Table 4, equal dimensions may be determined from numerous charts, but it is important that the width of the duct does not exceed four times the depth. Table 4 should not be used when the total equivalent length of the duct work exceeds 200 ft.

Table 5 gives typical supply and return air grille sizes for various air flows. The throw need not be regarded in sizing the return grille, but must be considered in the selection of the supply grilles. If a grille with too great a throw is selected, the air will strike the wall and cause a drafty condition at its base. If too short a throw is used, drafts may occur near the middle of the room. It is generally considered good practice to select a grille with a throw just short of the furthest wall, since this will minimize drafts and will usually give the most satisfactory operation.

Each branch duct of the duct system should have a locking type quadrant damper for use in balancing the air distribution and to provide uniform temperature in the conditioned space. Where zoning is required from one unit, motorized dampers may be used on the branch ducts.

It is recommended that ventilation supply ducts and ventilation louvers be approximately square in cross-sectional areas. In selecting louvers for the ventilation air supply, the following dimensions may be used:

Less than 500 cfm — 1 sq ft.
Less than 1,000 cfm — 2 sq ft.
Less than 1,500 cfm — 3 sq ft.

Normally, air will be exhausted by leakage through cracks around the doors and windows. However, occasionally exhaust louvers, or exhaust fans, are provided. The exhaust fan method is recommended. The exhaust fan capacity should be less than the capacity of the ventilation air duct so that natural infiltration does not increase the load on the conditioned space. Exhaust fans should be selected to handle the required cfm of exhaust air against about ¼ inch static pressure for the average exhaust duct. If the exhaust duct is long, the required static pressure should be calculated by a competent engineer. Louver sizes as given, may also be used for the exhaust louvers.

Installation

Occasionally, floor space will be very limited and it will be necessary to suspend the units. Many successful

TABLE 5—SUPPLY AND RETURN AIR GRILLE SELECTION
(Grille Size in Inches)

CFM	Return Grille Size, Inches	Feet of Air Throw					
		12	16	20	24	28	32
		Supply Grille Size, Inches					
100	10 × 6	8 × 4	8 × 4	——	——	——	——
200	10 × 6	12 × 5	12 × 4	10 × 4	10 × 4	10 × 4	10 × 4
300	10 × 8	24 × 6	16 × 6	12 × 6	12 × 6	12 × 4	12 × 4
400	18 × 6	30 × 8	24 × 6	14 × 6	14 × 6	14 × 6	14 × 6
500	12 × 12	——	24 × 8	24 × 6	24 × 5	16 × 6	16 × 6
600	18 × 12	——	36 × 8	30 × 6	24 × 6	20 × 6	20 × 6
700	18 × 12	——	30 × 12	24 × 10	30 × 6	24 × 6	24 × 6
800	24 × 12	——	——	30 × 10	30 × 8	20 × 8	24 × 6
900	24 × 12	——	——	36 × 12	36 × 8	24 × 8	24 × 8
1,000	24 × 12	——	——	——	36 × 10	24 × 10	24 × 8
1,100	24 × 12	——	——	——	36 × 12	30 × 10	30 × 8
1,200	24 × 12	——	——	——	36 × 12	36 × 10	36 × 8
1,300	18 × 18	——	——	——	——	36 × 12	36 × 10
1,400	18 × 18	——	——	——	——	——	36 × 10

installations have been made with packaged units located in an attic and ducts leading to the conditioned area. Frequently, storage rooms and basements are available for installation of packaged units. One possibility that should not be overlooked in a large retail store with high ceilings, or any other similar retail establishment, is the installation of one or more units mounted high on the steel ceiling girders.

The most frequent installation of packaged air conditioners is where they are free-standing in the conditioned space. In new buildings or in modernization work, however, it is often possible to have completely recessed units. In several instances, successful packaged air conditioner installations have been made by installing the unit in the back room of a retail establishment, removing a portion of the back wall so that shelves may be built across the face of the conditioner. Care must be taken to avoid blocking either the supply or return louvers to the unit.

Water and Power Requirements

Normally, 85 to 90 gal per hr of water are required per ton of air conditioning. Because of the recent water shortage in many sections of the country, and restrictive ordinances in other sections of the country, limiting water consumptions for air conditioning, water cooling towers are often required on the larger packaged air conditioners. In many localities, fresh water is available in abundant supply from wells, rivers, fresh water lakes, and the like. City water may be used in most of the country. In such applications, some consideration should be given to the drain piping as well as the fresh water piping to the condenser.

In many cases, water cooling towers are installed because of a desire to obtain water economy rather than because of local ordinances. Cooling towers frequently are used to cool the condenser water in a recirculation loop arrangement, and are available from many reputable manufacturers. Whenever a cooling tower is used, a circulating water pump of proper capacity is also required. Often this water pump is an integral part of the cooling tower.

When purchasing a cooling tower, the following data should be specified:

(1) Outdoor design wet bulb temperature.

(2) Condenser water flow rate in gpm. Cooling tower flow rates are normally 3 to 4 gpm per ton, or roughly 2½ to 3 times city water flow rates. The choice between 3 or 4 gpm per ton will be determined by the over-all cost of the system comprising tower, pump, and feed lines. Cooling tower manufacturer's recommendations should be followed.

(3) The water temperature entering the condenser should be selected at approximately 5F above the design wet bulb temperature in high wet bulb regions. In low wet bulb regions, higher temperature differences up to approximately 14F are permissible. The actual temperature of the water entering the condenser should be determined in cooperation with the cooling tower manufacturer, but should not exceed 95F.

A packaged unit was placed in a rear corner of this shoe repair shop.

TABLE 6—TYPICAL COOLING TOWER SELECTION DATA

Based on General Electric Co.'s Packaged Air Conditioners

Design Factor	Nominal Rating of Packaged Air Conditioner									
	2-Ton		3-Ton		5-Ton		7.5-Ton		10-Ton	
	Selection Basis—GPM per Ton									
	3	4	3	4	3	4	3	4	3	4
Condenser water flow rate—gpm	6.1	8.2	9.8	13.1	14.9	19.8	25.4	33.8	34.1	45.4
Condenser water temperature rise—F	9.6	7.2	9.8	7.3	9.6	7.2	9.6	7.2	9.6	7.2
Condenser water, pressure drop, in feet of water,	4.6	8.1	3.0	4.6	8.1	12.7	10.1	16.6	16.8	29.4
Condenser to cooling tower water line pressure drop per 100 ft, in feet of water*	7	11	16	7	9	7	11	6	6	9
Condenser to cooling tower recommended water line. Min. pipe sizes, inches	1	1	1	1¼	1¼	1½	1½	2	2	2

*Line pressure drop includes an allowance for elbows and fittings normally required, providing pipe size recommended is used.

(4) The cooling tower cools the condensing unit water to remove the heat added by the condensing unit, the circulating pump, and the connecting water lines. The cooling tower manufacturer should be required to guarantee cooling performance of the cooling tower for this purpose. Generally, cooling tower capacity will be 20 to 25 per cent greater than the cooling load determined by the long form calculation method.

(5) Cooling towers are frequently provided with circulating water pumps. For this reason, the cooling tower manufacturer will determine the pressure requirement of the pump specified. Occasionally the air conditioning contractor will supply the circulating pump. In such cases, the pump should be selected to deliver the required gallons per minute against the head in feet of water which is equivalent to the pressure drop in the condenser, the connecting piping, and the cooling tower—the latter normally being 6 ft in the range of 2 to 10 hp units. See Table 6 for cooling tower selection data.

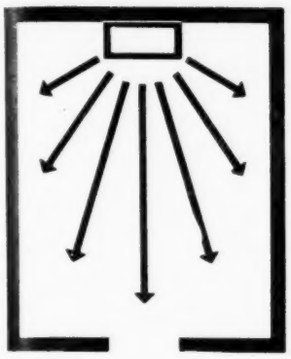
In the application of packaged air conditioners, plumbing will be required for supplying and carrying away the condenser water, and for carrying away the condensate or the moisture which drips from the cooling coil during the dehumidification process. Suggested pipe sizes are given in Table 7. When packaged air conditioners are also used for heating, steam or hot water piping is required. Steam piping sizes for five standard sizes of packaged or self-contained units are shown in Table 7.

Packaged air conditioners have power requirements which can usually be met by the utilities in all communities. However, on some installations, special wiring will be required and the local power company should be requested to advise on and approve all installations. Three-phase, 60-cycle power is recommended as the best choice when more than one power service is available, because wiring sizes can be smaller and initial equipment cost will be less. There is also some saving in the operating cost. Packaged air conditioning units are available for most power supplies common in this country. For details regarding the

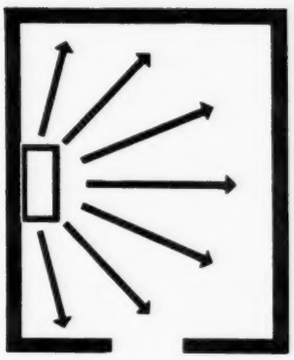
TABLE 7—TYPICAL PLUMBING PIPING SIZES FOR PACKAGED AIR CONDITIONERS

Pipe Use		Size of Packaged Unit				
		2-Ton	3-Ton	5-Ton	7.5-Ton	10-Ton
		Pipe Diameter, Inches				
Condenser Water Piping Sizes, In and Out	City water used	½	¾	1	1¼	1¼
	Cooling tower used at 3 gpm per ton (From Table 6)	1	1	1¼	1½	2
	Cooling tower used at 4 gpm per ton (From Table 6)	1	1¼	1½	2	2
Condensate drain line from drip pan		1	1	1	1	1
Steam supply line		1¼	1½	2	2	2½
Steam condensate return—dry		¾	1	1	1¼	1¼

Six diagrams of air flow to show how easily a self-contained air conditioning unit can be adapted to fit practically any space. While most frequently the unit can stand directly in the space to be air conditioned, there are situations where some easily installed duct work can make the operation more efficient for the job to be done.

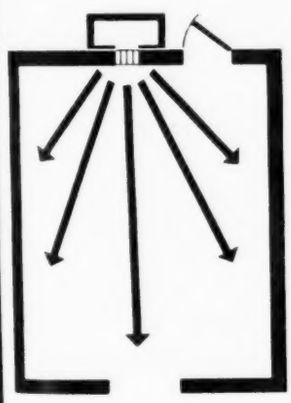


1 Located in the conditioned space, serving that single space only. Conditioned air is distributed evenly over the entire area from three sides of the distributor head.

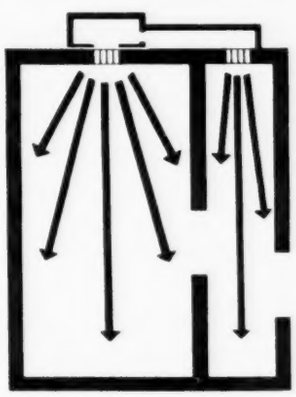


2 Here a differently shaped space requires a different distribution of air. This is easily arranged by adjustment of the louvers and vertical vanes.

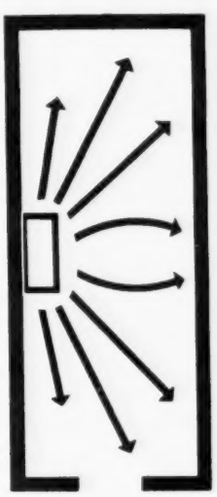
3 In stores, offices, or other areas where space is at a premium, the unit may be located in a back room, outside the area to be conditioned. A simple grille cut through the partition discharges the conditioned air. Recirculation is achieved through a door in the partition.



4 In this instance the self-contained air conditioner serves two separated spaces. Air is discharged into the larger space directly through a grille at the front of the unit. A duct from the side of the unit discharges air into the small adjoining space or room.



5 To distribute the air evenly over this space, adjustable louver assemblies are placed in the side openings and the airflow pattern regulated by means of these assemblies.



6 Wherever small booths are required, perhaps as in phonograph shops or similar applications, a single duct extension can be used to service each booth as well as the main store.

available power supplies, or the power and control circuit specifications, reference should be made to the manufacturer's product data specification sheets and installation instructions.

Applications

On page 86 is a typical tavern installation. Here a 3 hp packaged air conditioner is installed in a cocktail lounge. Room air is drawn into the unit through the lower grille and discharged through the top grille. Although this article does not discuss the load calculations nor the selection of equipment, it is very important to consider the internal load in taverns and night clubs as they usually exceed the external load. A rather high percentage of fresh air is usually provided to counteract the haze of smoke and the large internal latent load. Generally speaking, the heaviest load occurs in the early evening when sun effect is of little importance. Louvers may be adjusted to direct air to the front of the cocktail lounge as well as to the bar section and to the door of the adjoining dining room.

Internal load also plays an important part in studios, assembly rooms, funeral homes, and the like. Store coolers, either in single or multiple units, are usually adaptable. Fresh air is again a very important and vital consideration.

Generally, in beauty shop applications, duct work is used so that air can be directed to the individual booths.

On a large job it is important that a competent engineer be engaged to select equipment size, duct

Typical tavern installation with the packaged air conditioner placed in the cocktail lounge.

sizes where required, properly locate the equipment, and to decide which units will handle the fresh air supply and which the recirculation air. However the system is installed, it is important to locate the units to provide the best possible comfort in the area.

The self-contained or packaged air conditioner may be easily adapted to a space. Regardless of the shape of the room, or the number of rooms involved, packaged units, with or without duct work, can distribute the cold air evenly over the space by adjusting the louvers and the fan speed or by the use of duct work. Air may be discharged at the front of the unit or at both sides by adding adjustable louver assemblies to the side openings. The adjustable louvers and vertical vanes fan out the air in the proper manner at nearly all locations. The small amount of space required for packaged air conditioners can usually be found in some out of the way spot that would otherwise be of little commercial use.

No dissertation on packaged air conditioners would be complete without an indication of the practicability of installations in buildings much larger than those for which these units were originally intended. The increasing use of packaged units in applications where formerly central plant type air conditioners were considered to be the best answer, is in itself evidence that the limits of application for self-contained air conditioners have not yet been reached.

Applications of a Portable Continuous Smoke Recorder

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Possibilities of a new instrument for laboratory and field work in smoke testing, with particular regard to oil burners, are described. The Socony-Vacuum Continuous Smoke Recorder was developed by the Burner Fuels Division of the Technical Service Department of the Socony-Vacuum Laboratories to meet the need for a portable instrument of sufficient accuracy and versatility for continuous smoke measurements on small installations, including domestic oil burners.

ASIDE from the non-continuous, well known testers (Shell, Bacharach, Mobilheat Combustion Tester, etc.) which deposit a smoke patch on a filter paper surface, there are also a number of continuous smoke recorders employing direct photo-electric methods. Most of these photo-electric instruments are designed for the operation of stack and other combustion controls, and often are used for transcribing a record onto a chart. Exacting installation requirements, lack of portability, and poor sensitivity to smoke below the visibility level are among the handicaps which interfere with use of these instruments for testing performance of small units.

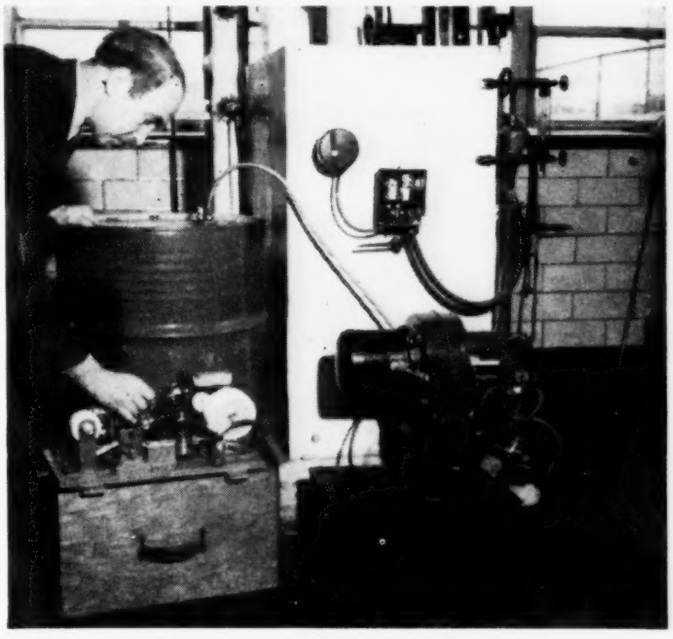
Although under equilibrium conditions of operation, spot testers are usually satisfactory, a continuously recording device presents a more reliable, uninterrupted picture of changes in smoke, notably those occurring at the start and the end of a combustion period. For these reasons, it would seem that the Socony-Vacuum Continuous Smoke Recorder could perform a useful function in association with other automatic recording instruments for combustion work.

This new instrument is based on the well known principle of filtering a known volume of flue gas to obtain a soot deposit on a filter, the optical density of this deposit then being a measure of the smoke content of the entire flue gas stream. The novel features of this design are the mechanical means which make it possible to produce a continuous trace of smoke deposits on a filter tape. This is accomplished by pulling the tape through a specially designed fixture interposed in the gas stream which is drawn continuously from the stack by a vacuum pump. The tape is kept moving by rolls geared to a synchronous motor to insure uniform speed. The varying degrees of darkness of the trace furnish a measure of the smoke conditions under which the burner is operating. While passing through the instrument, the tape is marked with a suitable time scale for the purpose of indicating the duration of the test as well as for evaluating the rate of change in smoking. For chart recording purposes, a supplementary attachment using a photo-electric principle is connected to the tape recorder proper.

A wide range of sensitivity is obtained by providing adjustments for the flow rate of the sampling stream of gas as well as the tape speed, and also, for special work, the area of tape exposed at any particular instant. An advantage inherent in these principles is the ability to produce an amplifying or cumulative effect, which is useful when dealing with low smoke densities, below the level of visibility. At present the smoke trace is recorded in two widths, ¼-inch and ½-inch, both on tape 1⅜-inches wide. A tape speed of 1½ or 3 inches per minute can be selected, or by changing the small roll drive motor, other speeds may be obtained. The flexibility derived from these features facilitates calibration of the instrument in units of already established smoke scales.

In judging the smoke records presented, allowance should be made for imperfections due to the method of reproduction. For better visibility the time scale is indicated on reproduction by small arrows.

Fig. 1 to 4 give a picture of smoke conditions for the start and cut-off of a gun-type oil burner, at different combustion chamber temperatures. Fig. 1 shows a typical cold start record of four-minute total duration, with a Shell-Bacharach smoke density of No. 6 im-



Author demonstrates portability and compactness of the instrument in operation alongside a domestic oil burner.

[1]This article is appearing concurrently in the June, 1950, issue of *Mechanical Engineering*.

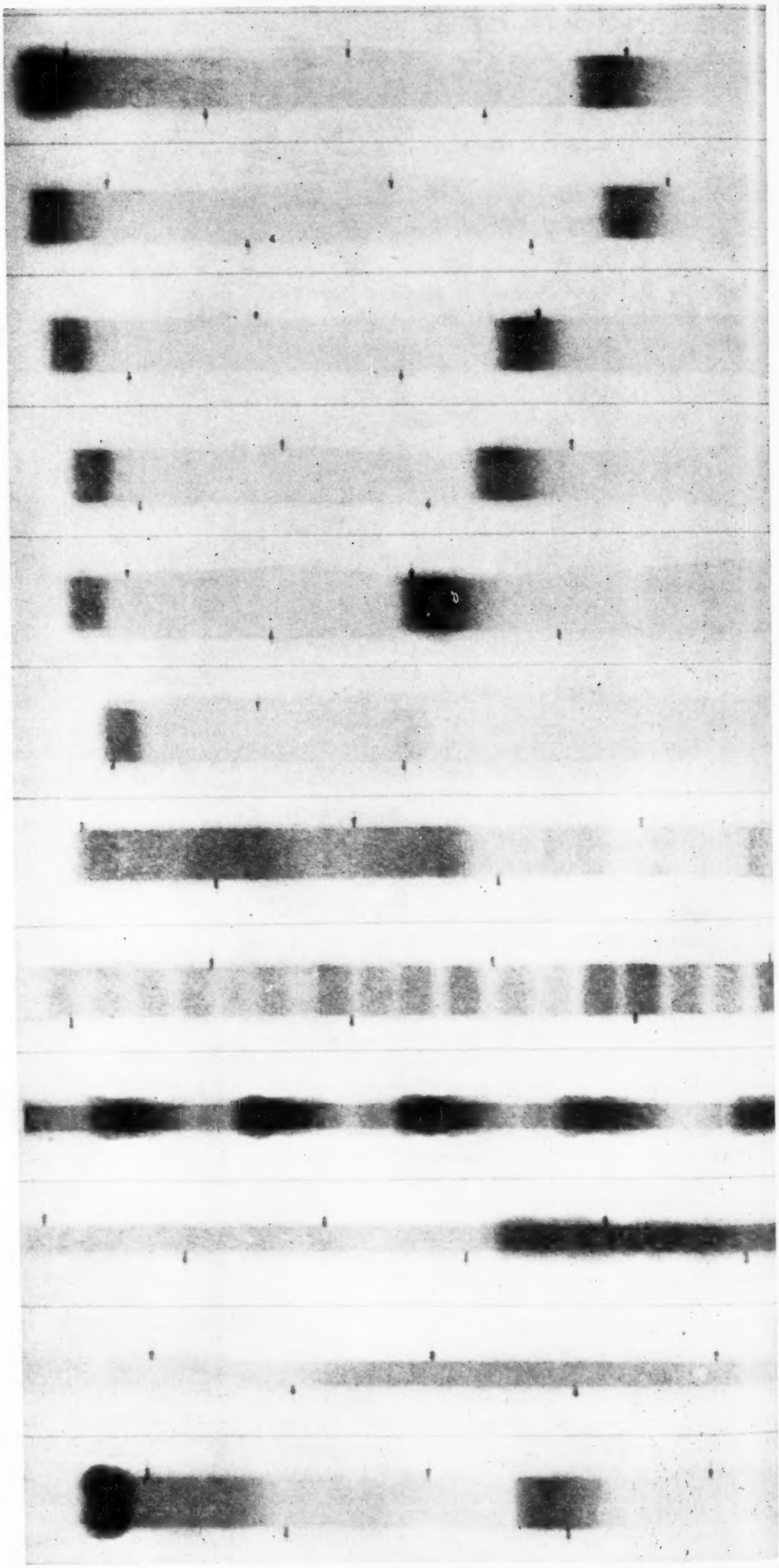


Fig. 1. Cold start of gun burner; 4-minute run.

Fig. 2. First re-start.

Fig. 3. Second re-start.

Fig. 4. Third re-start.

Fig. 5. Fourth re-start.

Fig. 6. Fifth re-start.

Fig. 7. Actual pulsation pattern.

Fig. 8. Artificially induced pulsation pattern.

Fig. 9. Burner on and off on safety control.

Fig. 10. Effect of draft change on pot burner.

Fig. 11. Effect of fuel rate change on pot burner.

Fig. 12. Smokey start and effect of air adjustment.

mediately after the starting puff, and of No. 2 just before the cut-off smoke. The time interval between these points is about three minutes.

Fig. 2 presents a re-start, under identical conditions, after a five-minute shut-off period. The effects of the preceding warm-up are already manifesting themselves in a general decrease in smoke. Not only are starting and cut-off smoke reduced, but the running smoke has improved from a No. 4 to a No. 1, during three minutes.

Fig. 3 and 4 are additional re-start runs of three-minute duration made after five-minute shut-off periods. Here the time to clear up from a No. 4 to a No. 1 smoke is reduced to two minutes, as compared to three minutes for the cold start shown in Fig. 1.

This type of record may be helpful in the practical evaluation of burner installations operating "on cycle," with particular regard to the effects of combustion chamber design and materials, refractories, etc. Records of this type could also serve as a basis for developing a standard method of comparing the rate of decrease in smoke over definite periods of time, both after a cold start or after a start on cycle.

Fig. 5 and 6 were taken for the purpose of demonstrating that cut-off smoke can be minimized by maintaining draft for a brief period after the extinction of the flame. The reduction in end smoke shown here was brought about by maintaining maximum draft through closing the stack draft regulator just before the burner shuts off. Another way of securing the same reduction would be by maintaining the combustion air supply after the burner shuts off; for example, by a free-wheeling blower rotor. However, such measures only alleviate the magnitude of cut-off smoke, and the practice of installing a quick acting, positive shut-off valve in the fuel line would tend to cure this difficulty at the source.

Fig. 7 illustrates the smoke pattern of a pulsating operation obtained under field conditions. The mottled appearance reflects an unstable state of the combustion process.

Fig. 8 was obtained by rhythmic variation of the air supply, resulting in what might be termed induced pulsations.

Fig. 9 shows what happens to the smoke when a burner goes off and on with safety control in action. It gives an idea of the copious quantities of soot produced if this were to continue for any length of time.

Fig. 10 and 11 were taken in connection with a pot burner test. The rapid darkening of the trace in Fig. 10 indicates the quick response to a reduction in draft, while the gradual transition from light to dark, as shown by Fig. 11, is the result of an increase in fuel rate.

Fig. 12 is given as an example of a very smoky start of a gun burner. About one minute after the start, the air shutter was opened further, resulting in a reduction of the smoke from Shell-Bacharach No. 6 to No. 3. The end of this three-minute run again shows a typical gun burner cut-off smoke pattern.

The sample records shown would seem to indicate that an instrument of this type may prove useful whenever a continuous trace of the smoke variable is required. Furthermore, a record including the time coordinate with its attendant advantages, is indispensable for investigating irregular fluctuations in the rate of smoking. Recent work has shown the deleterious effect of smoke upon efficiency and, therefore, an interpretation of a continuous smoke record made in conjunction with other relevant measurements may well speed up the solution of problems in various fields of combustion.

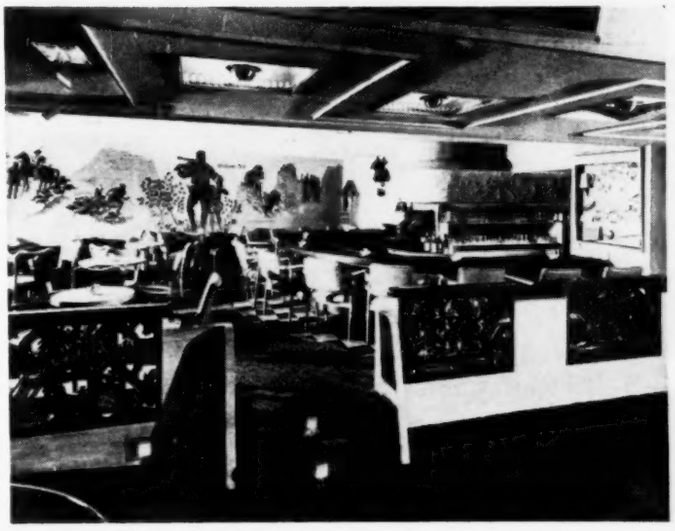
A number of these recorders, some equipped with photo-electric facilities for chart recording, are already in use for both laboratory and field work on oil burners, and their application to internal combustion engines and other variable smoke sources is being considered. Further, while this instrument, suitably modified, may be adaptable to the control of processes, other than combustion, involving gases and liquids, applications of this kind are beyond the scope of this article.

Air Recovery in a Restaurant and Lounge

At the Swiss Chalet and William Tell Room in Chicago's Hotel Bismarck, all the air is withdrawn every 2¼ minutes and replaced with clean, odor-free air.

The combined rooms are supplied with 11,500 cfm, slightly more than 38 cfm for each of the 300 occupants. Only 30% of this volume is new outdoor air, the remaining 70% being previously conditioned air restored to its original freshness by filtration through a W. B. Connor activated carbon unit. Even the outdoor air must pass through the recovery unit, thus insuring that no vagrant street or kitchen smells can enter the system.

If all the air had been drawn in from the outdoors, it is estimated that the cost of the additional cooling capacity required would have exceeded $7,000, not to mention the increase in operation expense and investment interest and amortization.



Architect-Engineer Relations Can Improve Engineering Design

HARRY W. TERRY
Consulting Engineer, New York, N. Y.

Closer liaison between architect and consulting engineer can stimulate both toward improved design and may save costly redesign by reducing errors or misunderstandings in early stages. Mr. Terry reports on a personal survey among architects' offices.

THERE are listed in the Manhattan classified telephone directory about 675 registered architects, about half of whom make regular use of the services of consulting mechanical, electrical and structural engineers as appropriate in the design of modern buildings. Few New York architects maintain a staff of engineers in their own offices. Instead, there are about 100 licensed professional engineers in Manhattan, of whom perhaps ten prepare the large majority of mechanical and electrical plans and specifications for architects in Manhattan. It is with the services of these consulting engineers that this article is concerned. A telephone survey supplemented by personal interviews in many architects' offices shows what New York architects expect of their consulting engineers and what they have done to assure a satisfactory relationship. The questions the survey answered are as follows:

What services do consulting engineers normally render?

Have there been failures in the services rendered?

What has been the cost to the architect of these services?

What must architects do to get more satisfactory service?

The majority of the mechanical and electrical plans for buildings are being prepared for architects by consulting engineers with whom they are well acquainted and in whom they have confidence gained by long association. Criticism of engineers appears to be impersonal, and their services, if not entirely satisfactory, are of such uniformity that the faults of one are more or less the faults of all.

Most architects interviewed think that mechanical and electrical specifications should cover their subjects more succinctly, that closer liaison between the architect and engineer is highly desirable, and some believe that engineering drawings could with advantage be prepared in the architect's own office, even to the extent of showing much of the engineering work on the architectural drawings.

The most startling comment regarding consulting engineers came from an architect whose projects include a large number of nationally known hospitals and other institutions, he said:

"I have never found a consulting engineer who makes an adequate analysis of my drawings to assure that his soil and waste lines, his ventilating ducts and other facilities fit my design."

This architect insists that his engineer furnish him a set of black and white prints of his preliminary drawings of all mechanical and electrical work so that he can follow the line of each pipe, conduit, and duct, to be sure that each can be run concealed in the locations shown; that where steel girders must be pierced, this work will be done in the shop rather than in the field; and that wherever required, the necessary metal furring is shown on drawings. Only after this check has been made and preliminary mechanical and electrical drawings coordinated with architectural drawings, are the engineering working drawings started.

Failure to follow this intelligent procedure, recently caused an eminent New York consulting engineer to completely revise his working drawings for a New York bank building and seriously discommoded his architect-client as well as increasing his own drafting room costs. In another case, failure of the engineer to carefully follow the rulings on New York schoolhouse ventilation, necessitated many expensive changes in the architect's own plans as well as those prepared by the engineer.

No matter whether the project is large or small, mechanical and electrical planning should start with a complete analysis of the building design and the preparation of a basis of engineering design that meets all the needs of the project. Then when this composition has been cleared with the architect, the engineer can make preliminary drawings for the architect's approval, and only then should engineering working drawings be commenced. "Short cuts" common in planning during the war are neither economical nor time saving now. It pays, nowadays, to know before construction is commenced:

That facilities will fit the space allotted,

That heating, ventilation, illumination, etc., are all that will be required but no more, and—

That costs will not exceed the budget.

All of which means that complete liaison must be maintained between the architect and engineer during the initial planning stages, as well as later.

Engineering Fees

Generally, the architect employs a professional engineer to prepare contract drawings and specifications, check shop drawings and samples, and to give a limited amount of supervision during the construction of the building. For this service he may be willing to pay, if he is required to pay the engineer's fee out of his own compensation, 4% of the contract cost of the mechanical and electrical work. If the architect's fee

amounts to 6%, the 2% net the architect realizes on mechanical and electrical work, he retains on the theory it covers his overhead cost of such work even if it adds nothing to his profit. Or, to look at the matter in another way, if the architect is willing to accept a net fee of 5% for his services and is asked to include the cost of the engineering, he may be willing to accept a gross fee of 6%, 1% of which goes to pay his engineer for the plumbing, wiring, and heating portion of the work, usually amounting to 25% of the contract cost of the building.

Some architects complain that there is no set engineering fee agreed upon by consulting engineers as a standard price for their services. They say this is unfortunate and may place the architect in an unfavorable light with his client if the architect pays the cost of the engineering work and raises his own fee accordingly. The following costs to the architect have been mentioned to the writer as being current in New York. Complete engineering service including supervision:

Contract cost of Engineering	*Engineer's Fee*
$25M	6%
$50M to $100M	5%
$100M to $500M	4%
Over $550M	2½ to 3 times engineer's drafting room cost, also, based on estimated time, rates per hour, $10 to $20.
Small Buildings	Based on estimated time required, rates per hour, $5 to $10.

As mentioned in the early paragraphs of this article, a satisfactory relationship between architect and consulting engineer is the result of long association and the confidence built by working together on projects of mutual interest. And to be assured that their plans will not be delayed by congestion of work in a single engineer's office, architects generally maintain such a working relationship with more than one engineer. This series of multiple mutual contacts between architects and consulting engineers is no doubt responsible for the general satisfaction expressed with the services of consulting engineers but more particularly with the faults mentioned by architects as being common to all engineers. It is the architect who conveys the owner's wishes to the engineer and interprets them as he finds advantageous to his general plan. The engineer can, of course, make whatever recommendations he believes appropriate but he many times finds himself handicapped by decisions made by the owner and architect before he has had an opportunity to express his ideas. The modern building today requires better lighting, better heating, and particularly the most economical air conditioning. The standards of mechanical and electrical design are higher than ever before and failures to meet such standards reflect more than ever before on the reputation of the architect as well as the engineer. So it is imperative today that the architect have the best engineering advice.

Such recent engineering developments as the startlingly successful experiment in the extraction of heat from well water, as used in the new 12-story Equitable office building in Portland, Ore., should hold definite interest for all architects and they should demand that their engineers keep them fully informed of developments. It is not enough for the architect to know about new systems, he must also know how they should be applied.

The principle of radiant heating was familiar to the Romans but virtually unknown in the United States until the British built their Washington embassy in 1929. But it was not until 1937 when Frank Lloyd Wright embedded a few turns of steam pipe in the floors of the Johnson Wax Building in Racine that radiant heating was accepted. Even today in New York, few engineers have been required by architects to give detailed attention to the possible use of this type of heating with forced circulation of hot water and none at all to the use of forced warm air for radiant heating.

Better engineering service for the architect will only come when he and his engineer together dig a little deeper, probe a little further, scout a little wider, worry a little longer and think a little harder.

Heat by the Acre

Just a little over three-quarters of an acre of floor in the new hangar, now nearing completion, of the Pioneer Air Lines at Love Field, Dallas, Texas, will be heated by a radiant heating system. Hot water, circulated through wrought iron pipe embedded in the concrete floor, will maintain airplane engines at room temperature for easier starting. Temperature drop in other hangar applications of radiant heating has proven very low, even with the large doors open for considerable periods of time, and recovery of comfort conditions is quite rapid. Buford and Feinberg, architects; Herman Blum, consulting engineer. Shown in the photograph at right is a portion of the large-area grid coil of iron pipe prior to pouring of the concrete floor.

Methods for Supporting Pipe

J. E. YORK
Building Service Engineer, Stone & Webster Engineering Corp.

Part 2 of a group of articles that describes and illustrates the various means for supporting pipe lines. The author, experienced in pipe layouts, shows where each type support is used.

IN laboratories, high grade toilet rooms, hotel and cafeteria kitchens, or corridors of schools or other public buildings, it may be necessary or desirable to run piping exposed below the ceilings, along walls or above the tops of equipment or furniture. If good judgment is used regarding the location of the piping, and it is installed in a neat and orderly manner with suitable supports or hangers, this will not necessarily detract from the appearance of the surrounding space.

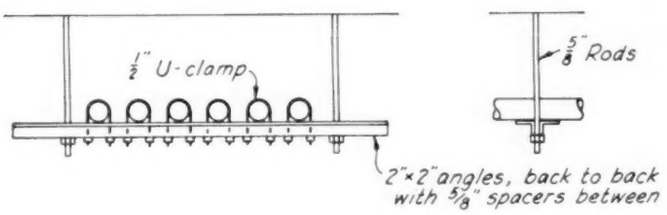


Fig. 22. Group type hanger.

Where it is necessary to run laboratory mains below the ceilings of a corridor, or overhead inside the individual rooms, it will generally be possible to run all of the supply lines, except steam and the condensate lines serving any particular area or item of equipment, at the same level and to provide group hangers for these lines.

Because of the necessity for pitching steam and condensate lines in opposite directions, these lines are ordinarily provided with separate hangers.

Group type hangers may consist of two angle irons bolted back to back with spacers between them to permit the use of U-type clamps to secure the individual pipes in their respective places, as shown in Fig. 22.

Steam and return lines, and individual overhead lines, may be supported by means of solid ring extension hangers, Fig. 23, or split ring extension hangers, Fig. 24.

If the hanger shown in Fig. 23 is used, it must be assembled and the ring slipped over the end of the pipe before it is installed in the line. Unless right and left threads are provided, no adjustment is possible after assembly. The use of the split ring shown in Fig. 24 permits installation of the hangers after the piping has been installed on temporary supports and properly graded and, if necessary, some adjustment can be made in the level of the pipe after installation.

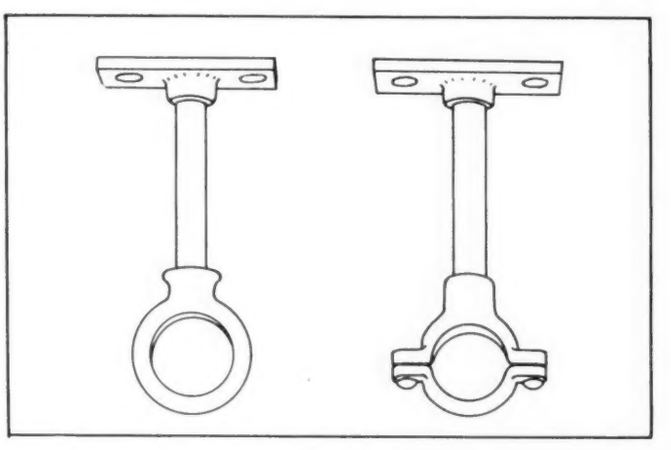


Fig. 23 (left). Solid ring extension hanger. Fig. 24 (right). Split ring extension hanger.

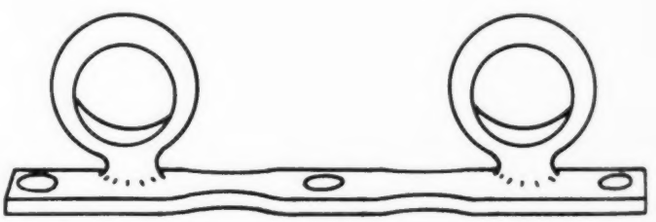


Fig. 25. Solid ring hangers with wall plate.

Solid ring hangers with wall plates or split ring hangers with wall plates, as shown in Fig. 25 and 26, may be used when pipes are to be supported from the walls. Where several pipes are to be run along the wall above furniture or equipment, special multiple hangers, Fig. 26, may be used.

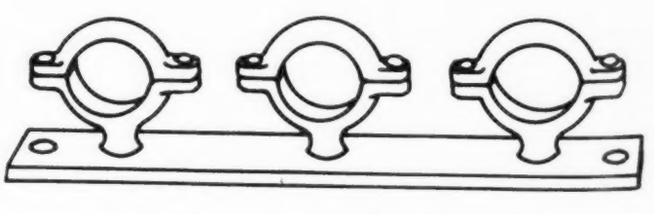


Fig. 26. Split ring hangers with wall plate.

Should plans make it necessary to run the lines close to the wall, a concealed screw hanger, often called an electrician's hanger, Fig. 27, may be used.

Similar type supports may be provided with flanges which are attached to the tops of furniture or equipment where the piping is to be installed at a consider-

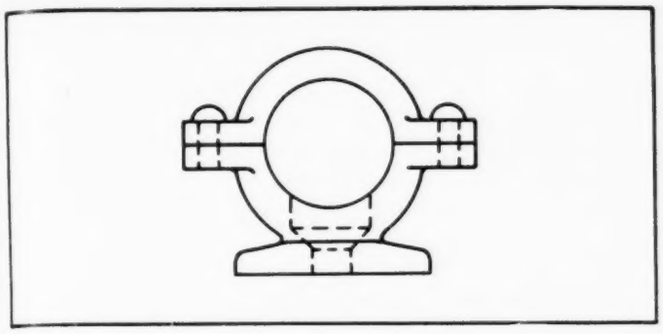
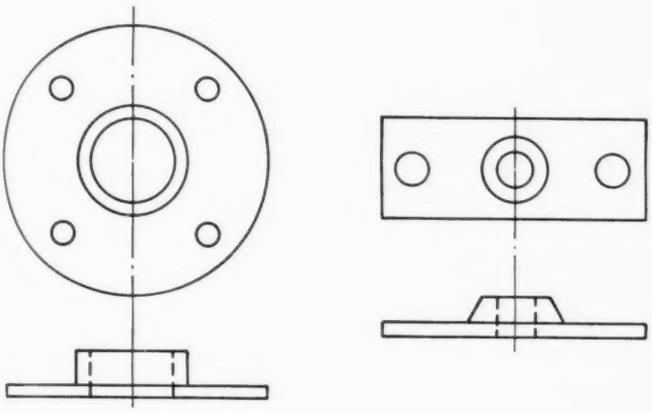


Fig. 27. Concealed screw or electrician's hanger.

able distance below the ceiling. Flanges may be round, Fig. 28, or rectangular, as shown in Fig. 29. A button type swinging hanger flange, Fig. 30, is used exten-



Flanges for pipe support. The round flange is at the left, Fig. 28, and the rectangular at the right, Fig. 29.

sively for supporting lines from sloping ceilings, and the swivel base hanger shown in Fig. 31 permits the pipe to be installed so that it will be at any angle with building or table.

Post Offices and Government Buildings

The pipe hanger, Fig. 32, conforms to the U. S. Treasury Department specifications for use in post

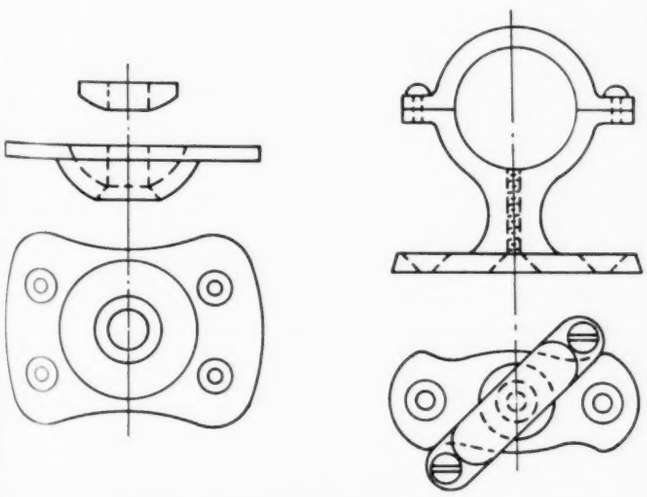


Fig. 30 (left). Swinging hanger flange. Fig. 31 (right). Swivel base hanger for supporting pipe at an angle.

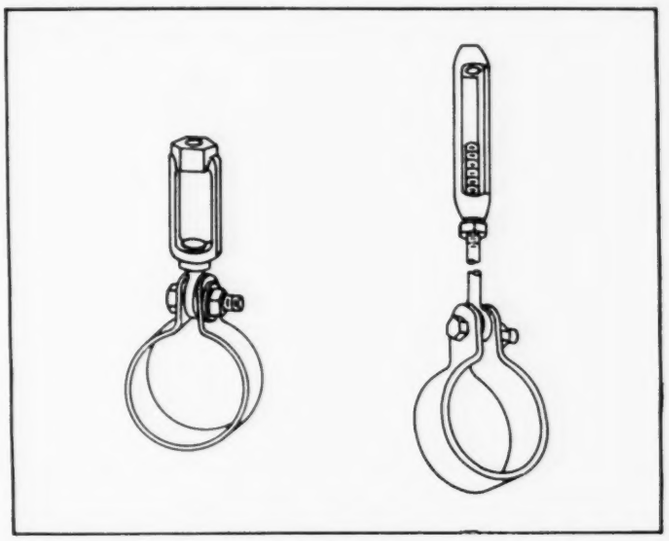


Fig. 32 (left) and 33 (right). Two forms of pipe hangers with steel straps.

offices and similar government buildings. It is standard on all Treasury Department jobs for all pipes carrying steam at 15 lb pressure or over.

The rings are constructed of heavy stock steel with adjusters of malleable iron. The lower portion of the adjuster is cast within the top section, which allows the top to rotate, thus raising or lowering the entire unit to the desired position. The top section is formed

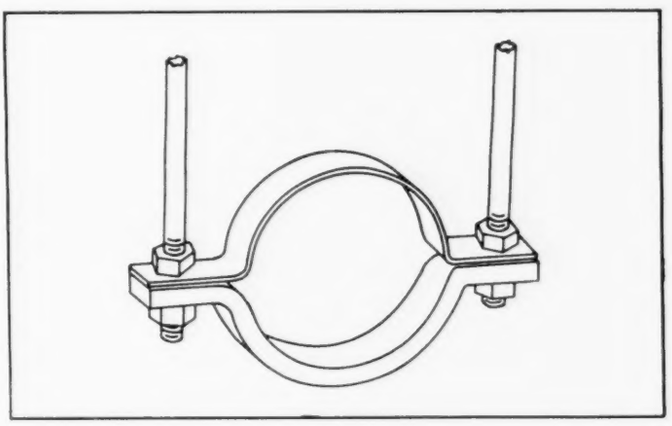


Fig. 34. Hanger with long threaded rods for adjustment.

in the shape of a hexagon nut to permit the use of a wrench when needed.

The hanger shown in Fig. 33 conforms with U. S. Treasury Department specifications for all low pressure steam, return, water, air, gas, soil, waste, vent lines and for electric conduit. The rings are of lighter stock steel than is used for the hangers shown in Fig. 32, and turnbuckles are used to provide the necessary adjustment.

Where space will not permit the use of adjusters or turnbuckles, the hanger shown in Fig. 34 will conform to Treasury Department specifications. The long threads on the ends of the hanger rods permit adjustment by turning the nuts on these rods.

Fig. 35 shows the hanger used by the Treasury Department on hot, cold, circulating and ice water lines,

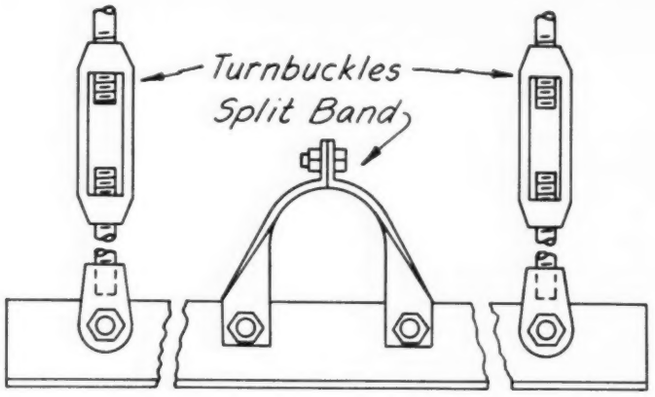


Fig. 35. Treasury Department hanger to accommodate three or more pipe lines pitched to the same grade.

air lines and electric conduit where three or more such lines run on the same grade and drop. When it is desirable to clamp the piping rigidly, split bands are

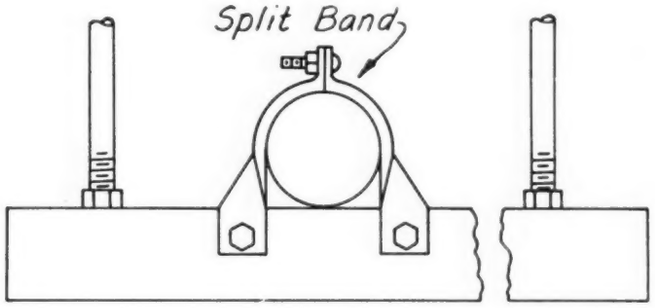


Fig. 36. Split band hanger with rod supports.

used to hold the pipes to the support bar. Where space will not permit the use of turnbuckles, the hanger illustrated in Fig. 36 may be used.

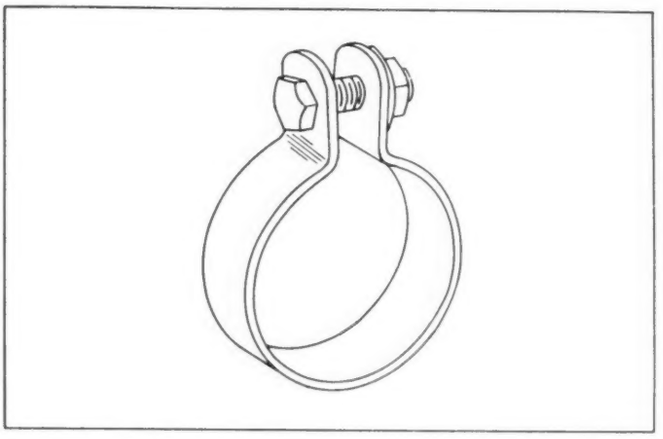


Fig. 37. Pipe hanger for use along a wall.

Fig. 37 shows U. S. Treasury Department hangers for use on pipe lines running alongside the wall and near the floor.

Use of hangers illustrated in Fig. 38 and 39 is permitted by the U. S. Treasury Department only where so specified on department drawings. Pipe clamps are made of ¼-inch round iron fitted loosely or tightly, depending on whether the pipes are hot or cold. A piece of 1-inch pipe is supplied to be placed as a roller under hot pipes.

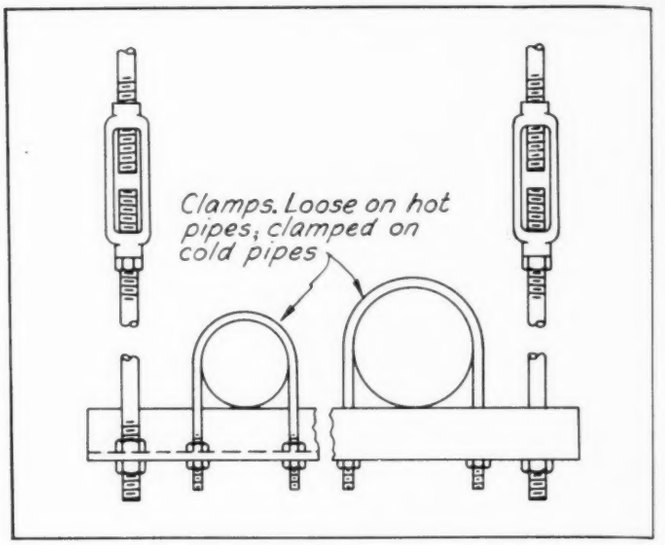


Fig. 38. Treasury Department hanger using turnbuckles for adjustments.

Some of the methods for supporting pipe hangers which are approved by the Treasury Department, and described in this article are shown in Fig. 38 to 40, inclusive.

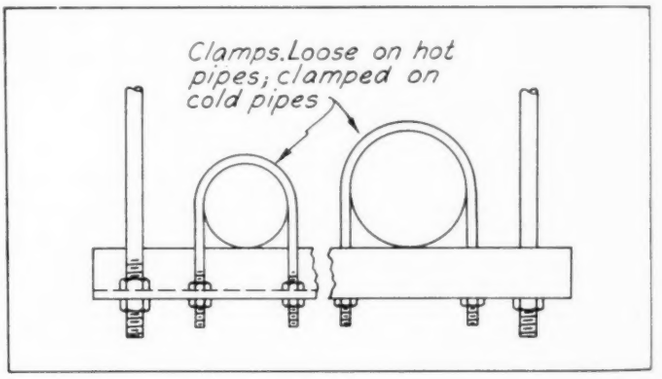


Fig. 39. U-clamps used with threaded rod supports.

Fig. 40 is for use for concrete and terra cotta floor construction, except in old buildings where the finished floor above is not to be disturbed. The hanger rod may be supported at the top by a bolt head or nut, or the rod may be bent over as indicated.

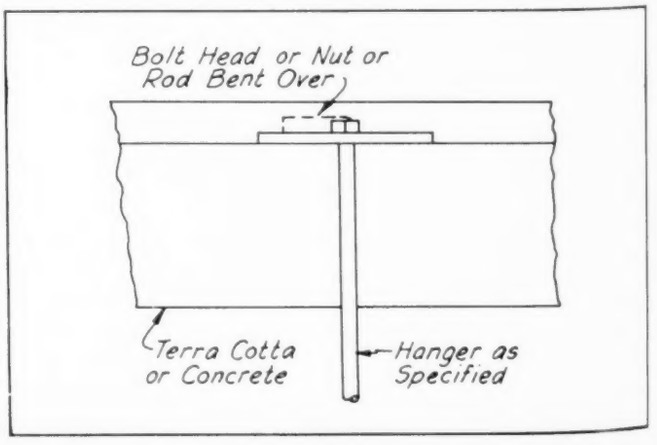


Fig. 40. For use with concrete construction.

Sonic Agglomeration of Fumes in Ferromanganese Blast Furnace Gas

Experimental work was conducted in the complex field of sonic agglomeration to study methods for effectively treating ferromanganese blast furnace gas. It is considered likely that although the process in its present stage of development was not economical, it would be advantageously used in other applications within the next few years.

A. H. BRISSE
Research Technologist, Research Laboratory, Carnegie-Illinois Steel Corp.*

AS part of a program to investigate practical methods by which to collect solids suspended in ferromanganese blast furnace gas, work was recently carried out by the Research Laboratory of the Carnegie-Illinois Steel Corp. on sonic agglomeration of such a fume. The intent of this work was to obtain a rough evaluation of the process in order that it might be compared to other methods of dust collection now in use.

The problem indicated that many variables would have to be investigated before any study could be made of the economics of the process. Basically, the following five items required definite clarification:

(1) Practical design of a sound generator for use with blast furnace gas.
(2) Required operating sound wave frequency.
(3) Minimum required operating sound pressure.
(4) Minimum necessary gas retention time in the sound unit.
(5) Practical design of an efficient sound chamber.

The provision of a suitable sound generator presents a problem in mechanical design which has not been solved to this date. So-called "clean" blast furnace gas, containing 0.05-0.10 gr per cu ft of suspended solids, is obviously not suitable for use with the very close clearances necessarily maintained between the rapidly moving parts of a conventional siren. To provide some outside source of clean inert gas for the siren clearly complicates the process.

The required operating sound frequency, sound pressure, and retention time could all be found directly by experimental work whereas the proper design of a sound chamber could only be answered after a great deal of working experience had become available.

Preliminary tests revealed that the sound system itself was quite effective when operating at frequencies between 1,400 and 2,000 cycles per second. It was possible to maintain sound pressures as high as 40,000 dynes per sq cn (166 decibels) within this frequency range without overloading the loud-speaker. The inability to explore frequencies over 2,000 cycles per second with the equipment used did not appear to be a serious drawback as other workers had found that frequencies in the neighborhood of 1,500 cycles per second were quite effective for sonic agglomeration of dust. A pressure of 40,000 dynes per sq cn, the maximum obtainable with the equipment used, represents about forty times the sound pressure which the human ear can endure. These sound intensities were obtained by adjusting the frequency to produce resonance in the chamber at which time the amplitude at the peaks of the standing waves was six to eight times the amplitude of the speaker power wave. Because the velocity of sound changes with temperature, it was necessary to regulate the frequency in order to maintain resonance whenever temperature changes occurred. Stable temperature conditions were usually reached in 15 or 20 minutes. After this time the frequency could be held constant for the duration of the run.

Considerable clogging of the equipment by the agglomerated dust occurred despite the fact that all the equipment was heated and insulated to prevent condensation of moisture. It is important to note that no such trouble was ever experienced with unagglomerated dust. Because of these plugging difficulties, it was nearly impossible to obtain quantitative measurements of agglomerating efficiency on this small equipment. It was possible, however, to determine whether or not appreciable agglomeration was taking place.

Results of Tests

A number of tests were conducted in which sound frequency, sound pressure level, and gas flow rates were varied. The results, although qualitative, were considered reasonably accurate for the purpose intended and are briefly summarized.

(1) Frequencies between 1,400 and 2,000 cycles per second can definitely be used for agglomeration of ferromanganese dust.
(2) For effective agglomeration, the minimum root mean square value of sound pressure at the resonant pressure peaks must be close to 160 decibels. The critical value seems to be approximately 157 decibels, below which value practically no agglomeration occurs.
(3) The minimum retention time of the gas in the sound chamber for appreciable agglomeration was found to be well over 3 seconds. Below 3 seconds, no agglomeration was apparent.

Based on the results of this work, it was concluded that the sonic process in its present stage of development was not economically attractive for the case at hand. The results did indicate, however, that sonic energy can be effectively used as a means for fume agglomeration.

*From a paper presented before the A.S.M.E. Process Industries Division and the Pittsburgh Mechanical Engineering Conference, Pittsburgh, Pa., April 24-27, 1950.

Experience is my Classroom

By T. W. REYNOLDS

• DESIGNING FOR THE PEAK

Industrial air conditioning systems are commonly designed to take peak loads. This is not the case ordinarily for purely comfort conditioning. Cost may be too great, yet there is much to be said for making the capacity of comfort jobs equal to the maximum load and thereby having comfort at the time we most appreciate it.

I have in mind a particular air conditioned office layout where occupants of adjacent areas have clamored for air conditioning, where loads from lights and occupants have increased in existing spaces as business increased and where additional office area is to be acquired. The existing equipment cannot be increased in size due to lack of space and unreasonable cost, but room coolers can be added here and there. This is the best arrangement, having least cost in mind, and will give some satisfaction.

How much better had the existing equipment been originally designed for peak loads, for in the case in mind it would now be adequate without additional cooling equipment. Leaving aside this past season of hot weather, we in New York City seldom have successive days of very hot weather. Too, our nights are cool. On the other hand, there are localities, where the days, or weeks, and even the wind, stay hot with hardly a break and the nights give no relief. Such a locality is Minneapolis, yet who on the eastern seaboard normally thinks of anything in Minnesota needing air conditioning. I do, for I have stayed there six weeks at a time in the summer months. Anyhow, the point here to be made is whether or not we should design for peak loads, at least in such localities.

Incidentally, upon occasion during the winter, the outdoor temperature in Minneapolis drops to 30 deg. below zero and stays there longer than the flywheel effect of heat absorbed in the structure can carry over. Here, again, it is a question whether one should not design for the peak.

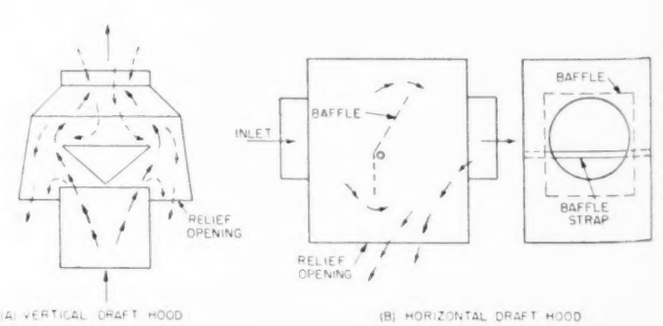
• THE DOWN-UP-NO-DRAFT DIVERTER FOR GAS APPLIANCES

The broken flue connection indirectly connecting a gas appliance (such as a heating boiler or water heater) with a chimney is variously called a down-draft diverter, a back draft hood, or just a draft hood. Of these names, the first is the usual nomenclature, but many users are misled because of this misnomer, not appreciating that the hood also protects the burner flame of the gas appliance from excessive up-draft, as well as no draft at all, such as with a blocked up flue beyond the hood. Since the hood has only to do with draft up or down, or none at all, it might be designated more properly as a draft hood.

In burning most fuels, chimney draft is required to insure proper combustion, especially where the draft must draw air through the resistance of a fuel bed. In the case of a gas appliance the slight draft required to pass through the appliance is provided by the design of the appliance itself. Flue connection to chimney is still required,* but the chimney need be sufficient only for the removal of the products of combustion and any escaped toxic or unburned explosive gas as delivered to the draft hood.

Since no sizeable draft is required through the gas appliance, it is neither necessary or desirable that the vent outlet on the appliance be extended with tight connection to the chimney. Instead, an intercepter or draft hood should be installed to pass the products of combustion along to the chimney, yet neutralize or break all positive action of the chimney upon the appliance itself to the end that neither down- or up-drafts will pass through the appliance. Gas chimneys are more susceptible to down-drafts because the natural up-draft within such chimneys, due to temperature, is weak. Obviously, the stack temperature must be low where the heat of the fuel is so efficiently extracted and the flue gases mixed with a lot of secondary or cool room air entering through the relief opening of the draft hood.

*Not required in certain cases of light load, as covered by specific rulings of utilities and others.



The Down-Up-No-Draft Diverter for Gas Appliances.

Note: Mr. Reynolds is Chief, Air Conditioning Division, Abbott, Merkt & Co., Engineers, New York.

When a down-draft encounters the interior cone of the vertical draft hood (sketch *A*), it is blocked and deflected by this cone out into the room by way of the relief opening. Although the downward gust may be sudden and temporary, the burner flame within the appliance will not be smothered and meanwhile its flue gases will be aspirated and turned to be mixed with the down-draft that finally loses itself to the room. Such action has been frequently demonstrated with a fan blowing down and with cigarette smoke within the appliance. As the fan speed is stepped up, the greater the aspiration becomes.

The draft hood checks any excess upward draft by drawing in room air through the relief opening, again protecting the burner flame and, incidentally, avoiding complaints of high gas bills from excess air cooling the gas appliance during operation or perhaps long hours of standby.

Of the various types of draft hoods, the vertical cone type (sketch *A*) has been found most satisfactory. This type should never be installed in a horizontal position. For such position, a draft hood of the type shown in sketch *B* would be used. With either of these types, an open tee may be added to check chimney draft if in excess. A draft hood may be of design other than shown, providing it still meets certain requirements. Relief opening must not be obstructed by any part of the appliance or adjacent construction. Insulation on the appliance must leave 2 inches of clearance between it and the apron of the draft hood, but the hood must otherwise be kept close to the flue collar of the appliance to eliminate flue action before the draft hood.

Gas appliances should not be located where strong natural or mechanical drafts are likely to cool appliances outwardly or inwardly, or possibly cause pilot failure. An exhaust fan may even reverse the flue action on an appliance with dangerous results. The relief opening of a hood helps also to ventilate the room it is in but, for this reason and reasons of safety, the room must have suitable provision for insuring make-up air for ventilation and combustion in sufficient quantity at all times. Any air inlet should not depend for its air upon other areas too tight or likely to ever be closed off. The air inlet should have at least 9 sq in. of free air area for each 5000 Btu per hr of appliance size. Such an area will pass for the given unit size 110 cu ft of air per hr at a velocity of 30 fpm.

Utilities and other authorities require that one can block off a flue or impose a total down-draft pressure of from 0.01 to 0.05 inches water column at the outlet of a draft hood without changing combustion, the concentration of carbon monoxide not to exceed 0.04% under such circumstances. They also require that a chimney action or static up-draft (numerically totaling between 0.06 and 0.07 inches water column when applied at the outlet of a hood) shall not cause a fractional increase in the volume of flue gases greater than twice the numerical sum of the pressure head and five times the velocity head expressed in inches of water column.

• SMALL ROUND DUCTS FOR HEATING

Richard H. Poe, Northeast Utilities Equipment Corp., Stamford, Conn., writes as follows:

Your article on small round ducts for heating in the August, 1949, HEATING AND VENTILATING was of great interest to me. In this connection I would advise that the Stewart-Warner model No. 993 Midget furnace uses 6-inch round ducts as standard procedure. Ducts of this size would not, of course, be suitable for use in ground floor slab; however, in our southern territories we have been mounting the furnace in the attic and using high wall registers.

"Your article states that modulating control with gas is not yet available; however, such controls are standard equipment on certain Stewart-Warner models. I would also point out that some houses are built so tight that normal infiltration does not supply necessary air for combustion, so that outdoor air must be admitted directly to the furnace space. Incidentally, the LPG schools at Tulsa University and Pittsburgh recommend a grade of ¼ inch per running foot of flue pipe. This procedure maintains a high stack temperature and velocity."

The literature enclosed by Mr. Poe shows an interesting application of room heating units in place of a central furnace. Each unit, of self-contained type, is gas-fired and zoned by its own controlling thermostat. Gas (natural, manufactured, mixed or bottled) is burned in a sealed combustion chamber within the unit. The burner operates under the forced draft of a blower, drawing combustion air from outdoors and discharging combustion products to outdoors through a small sealed vent. Room air is circulated by a centrifugal blower at 200 cfm. Vent extensions up to 25 ft may be used to permit installation in an interior wall.

The unit may be free-standing or recessed partially or entirely in an outer or inner wall so that only the grille shows. It should be located as near floor level as possible so that cold air may be drawn in from floor level and not allowed to stratify below the return section of the grille. Nevertheless, each unit will heat one or more rooms although cabinet dimensions of the unit are only $11 \times 14 \times 32$ inches. No ducts are required.

• USE RULES OF THUMB WITH CARE

It is well known that the quantity of supply air to a conditioned space should in many cases be sufficient to circulate six air changes per hour within that space. This quantity is referred to as necessary properly to diffuse the temperature and humidity of the entering air in well occupied spaces. In corridors, stock rooms or other rooms of few occupants, this matter of diffusion is not quite so important.

Such rules of thumb, however, should not be a hard and fast rule, but should be used with caution and only to indicate non-conformable conditions which should be checked for errors. For example, rooms with ceiling heights of 10 ft and 20 ft can each have six air changes, yet one will receive an air supply in cubic feet double that of the other, or if the quantity is

made the same as for the 10 ft ceiling, then for the 20 ft ceiling there will be only three air changes. Nevertheless, the three air changes will be adequate despite the rule of thumb.

Disregarding the number of air changes, one would usually figure the quantity of air supplied to a room on the basis of 60F entering air and 78F maintained room condition. If we assume that this quantity happens to coincide with six air changes and a 10 ft ceiling, then it is apparent that six air changes with a 20 ft ceiling calls for air to enter at half the aforesaid temperature differential, in other words at 69F, a temperature which is rather high for best results.

Aside from the expense and the space required for ducts and equipment to handle such an unnecessary quantity of air with the 20 ft ceiling, there are other considerations to take into account, such as less comfortable conditions in the occupied area, due to the higher temperature of the entering air. Air at 69F will not drop so readily from the ceiling diffusers, while the cooling coil will not give anywhere near as much dehumidification as would be the case with 60F; furthermore, the higher temperature may require reheat if the designed dehumidification is to be obtained.

With air at 60F and less humidity there will be a much lower effective temperature. In addition, with a high ceiling one certainly needs air as cold as possible to get it down to the occupants. The size of compressor in both cases cited would be the same, but the refrigeration effect on occupants would be quite different.

• LIGHTING LOADS

In department store air conditioning it is quite common to figure the watts per square foot of the lights as a constant according to the kind of department and the particular floor, whether basement, first, or upper floor, with or without escalators. This may all be very well for general sales areas with more or less wide open spaces, but one should beware of the exceptional case which may occur in some department broken up into many small areas, each with its own individual lighting load.

In advance of detailed lighting plans, one may be told that the light load will be three watts per square foot, and so it may average out, but watts per square foot may eventually be found varying all the way from one to eight, according to which cubicle one enters. Total refrigeration for the department as a whole will be adequate, but quite some re-sizing of ceiling diffusers will be required to offset such extremes in wattage.

• SYSTEMS AT DIFFERENT PRESSURES

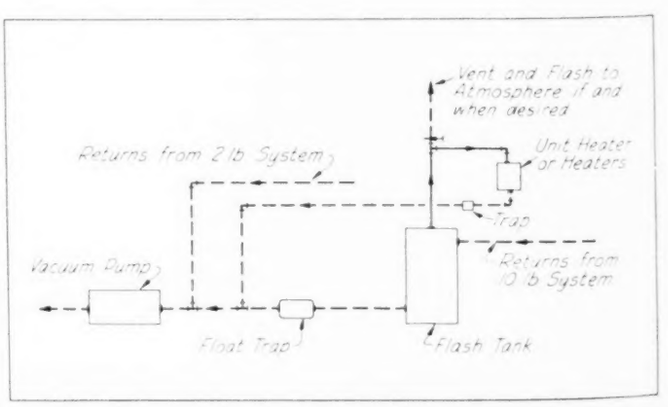
It happens now and then that an old heating system operating at, say, 10 lb pressure must be combined with a new and similar system as the building increases in size. If the addition is sizeable, it becomes desirable to operate the new system at 2 lb pressure with a vacuum return pump, in which event the old system cannot as a rule be readily changed over for 2 lb operation, either direct from the boiler or by pressure reducing valve.

Thermostatic traps work on a combination of pressure and temperature, else they would hold up water. Usually the thermostatic member is set for two degrees above or below the temperature of the steam and for 25 in. of vacuum up to 15 lb or even 25 lb pressure. So, to solve the problem presented, the old system must be changed over as outlined, or else be provided with a separate condensate pump. Where these things are not practical or economical in first cost or operation, a flash tank must be installed to lower the temperature of condensate in the 10 lb system down to that of the 2 lb system.

The accompanying sketch shows how this should be done. A float trap must be interposed as a seal between the flash tank and the vacuum return pump. Sometimes the trap inlet pipe is submerged within the tank so as to subject the pump to only the coolest condensate and eliminate any possibility to further flash of steam at the pump, which cannot readily handle steam. Also, this pipe may be formed within the tank as a further seal by means of a loop, but such an arrangement will often siphon.

The inlet of the return to the tank may also be submerged below water level within the tank, so that the tank water can be used to condense any entering steam, since such water has had an opportunity to cool down at certain times. The disadvantage of such an arrangement is the liability to water hammer and the increased load upon the disengagement area within the flash tank. When, however, the inlet return to the tank is submerged, any entering air is pocketed, and so a thermostatic trap must be provided in a by-pass to vent the air around the tank to the 2 lb vacuum system.

Steam as it is flashed may be vented to the atmosphere, but sometimes the flash steam can be economically utilized in one or more unit heaters which need steam most of the time. Air is then vented from the tank to the vacuum pump by way of the unit heaters and their thermostatic traps. The quantity of steam flashed will be the difference in the heat of the liquid at the two pressures divided by the latent heat at the flash pressure of 2 lb. For the assumed pressures this will be a little over 2%.



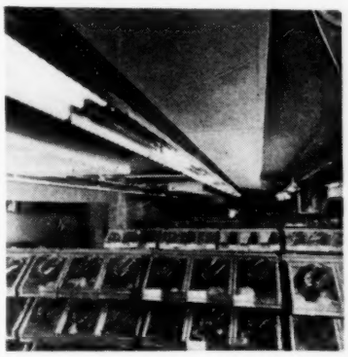
Systems at different pressures.

PRODUCT APPLICATIONS

New, Unusual, or Ingenious Uses of Equipment and Materials

Laboratory Animal Room Air Conditioned

PROBLEM: In the animal room of a large biological experimental laboratory supply air was to be at a temperature of 57F to maintain a temperature in the space at 73F with a total of 15 air changes per hour. Ceiling height was 8 feet and the cages wherein the animals were to be kept would be stacked to a height of 7 feet, leaving only a one-foot clearance between the ceiling air outlet and the uppermost cages. The problem was to keep as close to uniform temperature as possible from top cage to bottom and to maintain air motion not exceeding 45 fpm at any point.



SOLUTION: Pyle-National Multi-Vent perforated panel supply air outlets, making use of wide outlet area at low velocity, were installed over the topmost cages. The photograph illustrates the type of panel used but shows a different laboratory.

RESULTS: A temperature differential not exceeding 3 degrees from the one-foot up to seven-foot level was maintained with air velocities in any plane not exceeding 40 fpm. Preliminary data showed that the temperature one foot below the ceiling was higher than 68F when the supply was 57F.

Item P109

Dew-Point Recorder Helps Water Purification

PROBLEM: The Welsbach Corporation in Philadelphia had to use large quantities of the Schuylkill River and purify it so that no unpalatable after-taste remained. An ozone purifier was used and required large amounts of very dry compressed air.

SOLUTION: The Welsbach plant is the largest water purification installation in the United States using ozone to kill river water bacteria. In the ozone process, outside air is compressed, cooled and dried. The air is then blown past banks of metal plates charged with high voltage, which causes electrostatic discharge producing ozone, an unstable form of oxygen. The ozone is bubbled through river water from which sediment has been allowed to settle. The unstable gas oxidizes and kills bacteria in the water as it breaks down again into ordinary oxygen. Finally the water is filtered and pumped into city mains with only a trace of chlorine added. The compressed air used in the process must have a very low moisture content. To assure that moisture in the air remains constant during the process, a General Electric dew-point recorder is used to give a continuous record of air dryness.

RESULTS: Compressed air is maintained at proper dew-point for passing through electrostatic discharge plates. River water is treated without the use of unpalatable chemicals.

Item P110

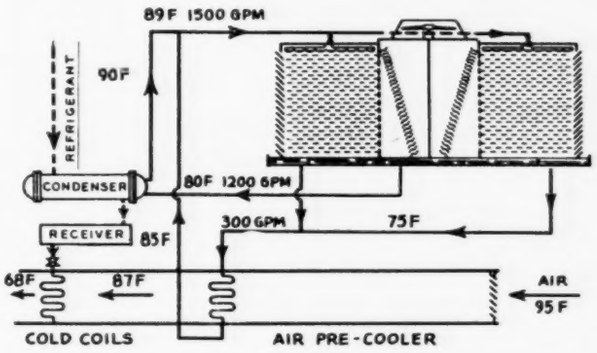
WANT MORE INFORMATION?

If so, just use the prepaid postcard opposite page 110. Write in the item numbers covering products in which you are interested. Sources will be asked to send particulars promptly.

Cooling Tower Serves Precooler and Condenser

PROBLEM: To cut down size of refrigeration equipment in an air conditioning system by using cooling tower water to precool the air before it enters the evaporator.

SOLUTION: Usually it is necessary to use two cooling towers to do this and the cost becomes prohibitive. A



Marley customer points out that, in cross-flow cooling, the water in a cooling tower is cooled from outside in as well as from top to bottom so that water on the louvered edge of the cooling tower is almost at wet bulb temperature. Applying this phenomenon to air conditioning, the Marley customer put a partition in the cooling tower basin to collect the cooler outside water which is then piped to an air precooler. The balance of the tower water was directed to the condenser.

RESULTS: By using water at near wet bulb temperature in an air precooler, economy in sizing of mechanical refrigeration components was effected. Air at 95F was cooled to 87F by the 75F water from outer sections of the tower. The precooled air at 87F was further cooled to 68F by evaporator coils.

Item P111

Room Cooler Saves Race Horses

PROBLEM: Racing enthusiasts of Singapore found that Australian horses brought to Malaya sometimes developed what is known as dry coat, which is a refusal of the sweat glands to function. When this state occurs and the horse is raced, death of the animal can result.

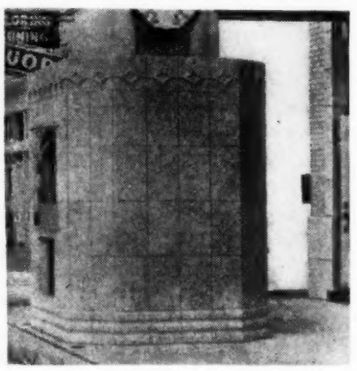
SOLUTION: Usually dry coat racers were sent to the hills where more favorable atmospheric conditions put the sweat glands back in action. This treatment became impractical during local disturbances near the hill stations. The government veterinary surgeon's office experimented with a packaged Frigidaire room air conditioner installed in a test stable. The reaction of the dry coat horse was similar to one undergoing the more expensive hill country treatment. After further trials, two new air conditioning plants have been installed at the Singapore Turf Club.

RESULTS: According to trainers, any horse stabled in air conditioned quarters not only avoids dry coat, but also runs better.

Item P112

Drive-In Teller Booth Air Conditioned

PROBLEM: At the Amarillo National Bank year 'round air conditioning was required for drive-in teller booth erected on the curb edge of the sidewalk several feet from the bank building. Only 8 x 6 feet on the outside and 6 x 4 feet on the inside, the booth would have been exceedingly hot in summer and cold in winter without year 'round air conditioning. To conserve space, air conditioning equipment had to be installed in the bank basement about 30 feet from booth.



SOLUTION: A hot water coil provides radiant heating while a steam coil and humidifying section in the air supply unit conditions incoming air in winter. Air for ventilation is brought from the alley end of the bank building in order not to compromise safety features of the bank. Refrigeration for summer air conditioning is supplied by a York condensing unit to handle a cooling load estimated at 7,400 Btu per hr. The York system provides about 750 cfm of air tempered and humidified.

RESULT: The teller booth is said to be one of the most comfortable spots in Amarillo the year 'round.

Item P113

Doors Hold Filters in Spray Booth

PROBLEM: In order to keep dust and dirt from entering a spray booth with makeup air, air must be filtered. In one garage spray booth makeup had to enter through the doorway.

SOLUTION: The operator fashioned a framework and inserted Research air filters as part of the booth's doors. The makeup air entered through the filters when the doors were closed.

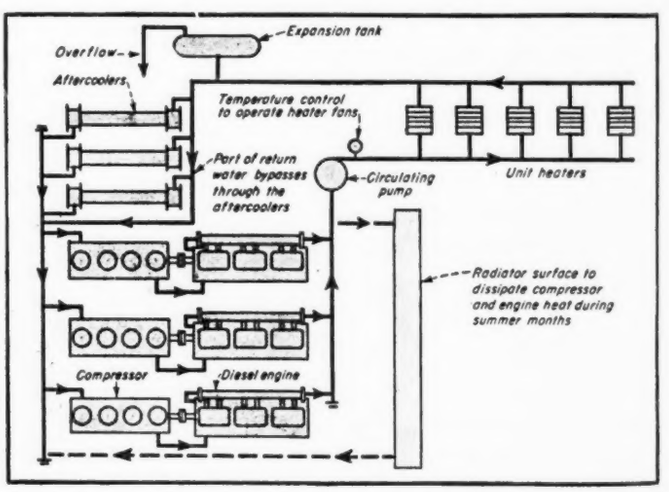
RESULTS: The filters cleaned the air entering the booth and kept out dust and dirt stirred up in the rest of the shop. Newly painted surfaces are kept clean and production, quality, and convenience in the spraying operation have been increased.

Item P114

Waste Heat Recovery Saves Fuel

PROBLEM: To recover waste heat from air compressors and their driving engines at the plant of Schramm, Inc., West Chester, Pa.

SOLUTION: In the Schramm plant, three large compressors, two driven by Diesels and one by a spark ignition engine, delivered about 400,000 Btu per hr into a system suitable for space or process heating. J. L. Michener, plant engineer, explains that the solution lies in making heat recovery equipment cost less than the fuel savings that result. In the Schramm plant the engine compressors are teamed with unit heaters. Engines are equipped with marine type water cooled manifolds. Water from engine jackets is circulated directly by engine pump through the heating equipment. In summer water is circulated as before but unit heater fans are reversed to discharge heat outside the building.



• **RESULT.**—Heat recovered is 1,250 Btu per hour per cfm of compressor capacity at 100 lb per sq inch.

Item P115

NEWS OF EQUIPMENT AND MATERIALS

Use the prepaid postcard on Page 111 for securing additional information on items described in this department.

Watts Safety Relief Valve

NAME—Watts A.S.M.E. safety relief valve No. 74.

PURPOSE — To protect hot water heating systems as required by

A.S.M.E. low pressure heating boiler code.

FEATURES — After thermal expansion pressure has been relieved, tight reseating is assured. When excessive steam pressure is released, unit provides positive and instantaneous reseating. A pressure seal isolates all working parts against flow of water or steam. The high Btu steam discharge capacity in this one valve provides full pressure protection, it is claimed, for over 80% of all hot water space heating installations. Body is constructed of all-bronze, while the spring is of stainless steel. The silicone disc is flexible and resilient, having high heat and erosion resistance without distortion so that tight seating follows. Unit is installed directly on the boiler. Unit will serve as a steam safety valve in the event that normal operating controls fail and an excessive water temperature causes steam to be generated. It permits a small quantity of water to be discharged to relieve pressure developed through thermal expansion.

MADE BY—*Watts Regulator Co., Lawrence, Mass.*

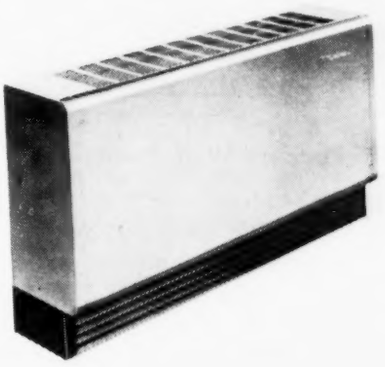
Item E181

Modine Conditioner

NAME—Modine cabinet unit.

PURPOSE—Cabinet type unit for space heating and cooling stores, offices, schoolrooms, and public building areas.

FEATURES—Resembling a convector, the unit is provided with quiet blower fans which draw room air into the unit through the inlet grille, passes the air through a heating or cooling coil, and then delivers the conditioned air to the area served. For fresh air intro-



duction in ventilating applications, a non-freeze coil and a plenum base with built-in manually operated mixing damper can be supplied. Unit is available with a choice of standard or non-freeze steam coils or a heating-cooling coil designed specifically for water. Liberal use has been made of resilient rubber mounting and isolation of motor and fans to prevent transmission of noises and vibration. Cabinet is designed for upright or inverted wall mounting. Attachment of a separately packaged optional plenum base adapts it for floor mounting. For ceiling installation, inlet grilles or duct connectors are available.

SIZES AND CAPACITIES — Available in five capacities ranging from 120 to 640 sq ft at 2 lb steam.

LITERATURE AVAILABLE — Bulletin No. 550.

MADE BY—*Modine Manufacturing Co., Racine, Wis.*

Item E182

Combustioneer Oil Burner

NAME — Combustioneer dHP oil burner.

PURPOSE—Oil burner for space-heating systems.

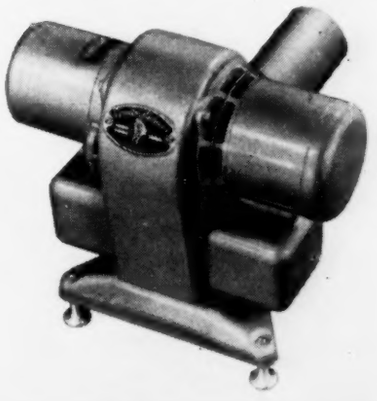
FEATURES—A new combustion head, named **Triple Velocity Visorhead,** has been designed to mix three main air velocities with the oil for efficient combustion. This new head is also designed to force the air downward at the nozzle. Flame burns the oil in suspension at the bottom of the combustion chamber. Unrestricted straight line metered air to the fan is said to result in quiet operation. Castings are machine finished for precision alignment and assembly. Both flange and pedestal base mountings are available.

SIZES AND CAPACITIES—Size ranges from fuel consumption of 0.85 to 2.0 gph.

LITERATURE AVAILABLE—Illustrated bulletin.

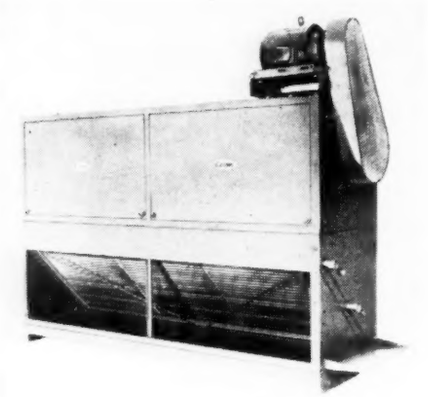
MADE BY — *Combustioneer Division, The Steel Products Engrg. Co., Springfield, Ohio.*

Item E183



Carrier Weathermaker

NAME—Carrier Weathermaker, Models 39S and 38T.
PURPOSE—Central air conditioning system.
FEATURES—Unit is completely sec-

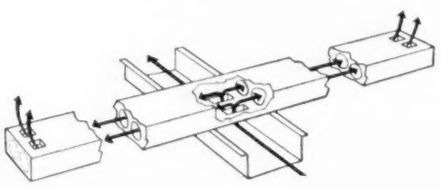


tionalized to provide ready assembly on the job. Even after assembly, all sections are accessible for maintenance and service. A spokeless, forward curve blade wheel is mounted on rubber bearings. The cooling coil suction is set at 45° angle to provide increased cooling surface and a high airway velocity. Heating coils and by-pass sections are separate. All coils are available in aluminum or copper fins on copper tube. A large base pan is used. All metal parts are coated with chlorinated rubber to prevent corrosion. The filter section is designed to operate with a low face velocity over a greater filter area. Units are adaptable to either automatic or manual control.
SIZES AND CAPACITIES — Range of sizes from 5 to 75 tons of refrigeration capacity.
MADE BY—*Carrier Corp., Syracuse, N. Y.*

Item E184

Flexicore Heating

NAME—Flexicore split system of warm air panel heating.
PURPOSE — Heating system which functions through the combined

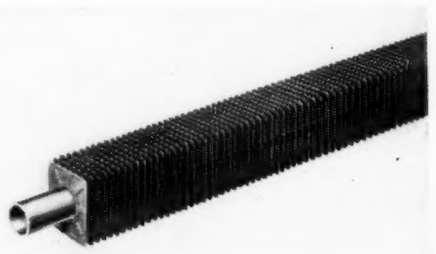


operation of circulating warm air through ducts to provide panel heating plus the advantages of a forced warm air system.
FEATURES—Air is released from the baseboard at the outside wall to blanket the window areas with warm air and to eliminate cold drafts. Floor consists of precast concrete units with pre-stressed steel reinforcements. Two parallel hollow cores 4⅝ inches in diameter run the length of each slab. These serve as supply ducts to carry warm air from a single sheet metal expanded plenum to the baseboard grille. As the warm air passes through the hollow cores, the entire slab is warmed, thereby providing a floor panel to heat the first floor and a ceiling panel to heat the basement. The smooth underside of these precast forms when caulked and painted, becomes an attractive panel ceiling. Any type of floor finish or covering may be used on top of these slabs.
SIZES AND CAPACITIES—Slabs measure 6 x 12 inches in cross section; available in lengths up to 22½ ft.
LITERATURE AVAILABLE—Bulletin.
MADE BY—*The Flexicore Co., Inc., Dayton, Ohio.*

Item E185

Fedders Wall Radiation

NAME—Fedders wall radiation.
PURPOSE—Wall radiation for heating industrial, commercial, and residential buildings.
FEATURES—The high heat output claimed for this line of wall radiation is achieved by expanding cold drawn seamless steel pressure type tubing into collared die formed steel fins that provide large fin-to-tube contact. Die form pattern of the fins creates a turbulent scrubbing action of air flow against fins as well as providing greater structural fin strength. Unit results in space saving installation. It is light in weight, easy to handle, and easy to install. Three types of enclosures are available—Type EM with one-piece expanded steel machined top and front; Type FT with solid front and grille in flat top; Type ST with solid front and grille in sloping top. Units are available with threaded ends for standard pipe connections or with plain chamfered ends for welding.
SIZES AND CAPACITIES—Available in lengths from 2 to 12 ft in 6-inch



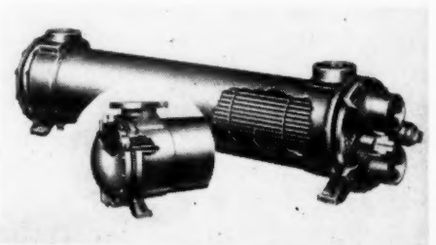
increments; 38 and 50 fins per foot on the 1¼-inch size; 24 fins per foot on the 2-inch pipe size.
LITERATURE AVAILABLE — Catalog WR-C1.
MADE BY—*Fedders-Quigan Corp., Buffalo, N. Y.*

Item E186

Ross Heat Exchanger

NAME—Ross heat exchanger, Type BCP.
PURPOSE—Heat exchanger for industrial use featuring all copper, removable tube bundle construction.
FEATURES—Bonnets are of cast bronze or forged brass with the hubs of cast bronze. The tubes are roller expanded into Muntz metal tube sheets. The floating tube sheet provides for expansion of the tube bundle. The tube assembly makes it possible to remove all the tubes at once for inspection and cleaning. New design is said to provide for larger heat transfer surface.
SIZES AND CAPACITIES — Available in single pass and 2-pass units, and in lengths from 18¾ to 79 inches.
LITERATURE AVAILABLE — Bulletin 2.2K1.
MADE BY—*Ross Heater & Mfg. Co., Inc., 1407 West Ave., Buffalo 13, N. Y.*

Item E187



Tempo Relief Valve

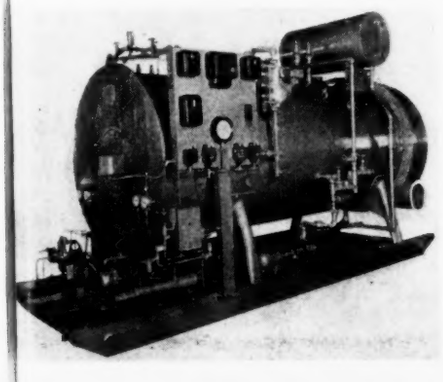
NAME—Tempo relief valve.
PURPOSE — Combined temperature and pressure relief valve.
FEATURES—Valve is available in several different types and specifications. It is a completely automatic reseating temperature and pressure relief valve with a bellows assembly that is entirely up and out of the water in order to forestall liming.

MADE BY—*A. W. Cash Valve Mfg. Corp., Decatur 60, Ill.*

Item E188

York Steam Generator

NAME — York - Power Steam - Pak Generator.
PURPOSE — Self-contained compact unit for the rapid generation of steam using gas, oil or a combination of gas and oil as fuel.
FEATURES—To facilitate adjustment of fuel-air ratio on all modulated units, a new linkage assembly is provided which permits independent adjustment of either blower air or fuel. New design features provide a minimum length of oil piping and closer placement of heating components, thereby improving unit's ability to handle the heavier and cheaper residual oils. Gas-fired 1950 models are equipped with a motorized gas shut-off valve in place of the conventional solenoid valve to insure instant and positive shut-off of main gas flow when required, as well as to slow opening action for lighting. High pressure boilers are now equipped with a double blow-down on each end of the boiler. Fiberglas insulation is applied to the boiler shell. Insulation casing jackets are 14-gage steel.



SIZES AND CAPACITIES—In sizes from 15 to 150 hp.
MADE BY—*York-Shipley, Inc., York, Pa.*

Item E189

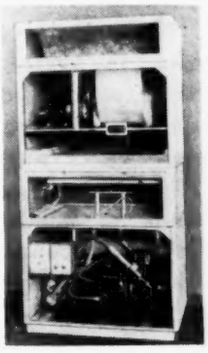
Coolpad

NAME—R-P Coolpad.
PURPOSE — An evaporative cooler pad material that can be cut to individual dimensions.
FEATURES—Material is made from layers of refined cellulose fiber strengthened with a plastic with added reinforcing metal. Makers claim there are no particles to break loose and damage pumps or drains. In use under normal conditions, material is said to be free from odor.
SIZES AND CAPACITIES — Standard size roll of 2-inch thick material, 20 ft long by 40 inches wide.
LITERATURE AVAILABLE—Bulletin.
MADE BY—*Research Products Corp., Madison 10, Wis.*

Item E190

Frick Air Conditioner

NAME—Frick air conditioner, Model 520.
PURPOSE—Space cooling.
FEATURES—Fan is of the heavy-duty blower type with double inlets. Shaft runs on ball bearings. A ½ hp fan motor is rubber mounted and has an adjustable pulley to permit changes in air capacity. Maximum fan capacity exceeds 2,000 cfm. Between the fan and the four rows of finned non-rusting cooling coils is an open space for the insertion of heating coils for winter operation. Below the finned coils is a coil of bare copper pipe for precooling the air and superheating the suction gas. The compressor motor assembly is the hermetic type that permits field service. It has cooling water jackets on both sides of the motor windings. The shell of the condenser is insulated. Electric controls are mounted on a panel behind a small access door. The main dial permits operating fan alone, the fan and the refrigeration system, or shutting off the entire unit.



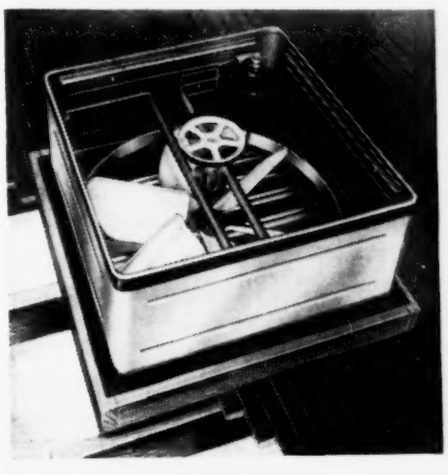
SIZES AND CAPACITIES—Dimensions are 42 inches wide, 27 inches deep, 36 inches high; capacity, 5 hp.
MADE BY—*Frick Co., Waynesboro, Pa.*

Item E191

Clipper Attic Fan

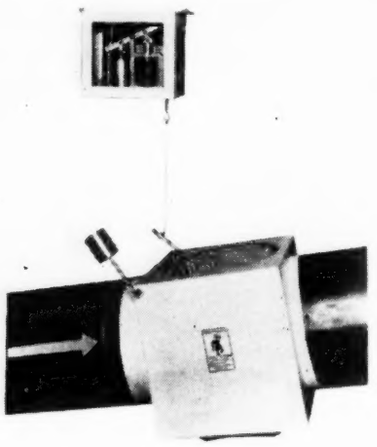
NAME—Rex Clipper attic fan.
PURPOSE — Attic fan designed for houses with low head room in attic.
FEATURES — Unit is designed for one-floor plan homes and similar services. It is available both as a fully packaged assembly and as a fan unit alone. As a packaged assembly, it includes the fan, resilient mountings, felt sealing strips and automatic ceiling shutter. Shutter is provided with a fusible link that automatically closes the shutter in case of fire. The shutter is also hinged so that the fan can be serviced from below.
SIZES AND CAPACITIES — The 28-inch model measures 29 by 29 by 13¾ inches. A 32-inch is also available. Air delivery is, respectively, 5,870 and 8,350 cfm.
MADE BY — *Air Controls, Inc., Cleveland 14, Ohio.*

Item E192



Thriftymatic Heat Saver

NAME—Thriftymatic heat saver.
PURPOSE — Device to reduce the stack losses associated with the on-off type of oil burner system.
FEATURES — Unit is designed for



use with residential and small industrial burners of the gun or rotary type. After burning operation, this unit is said to eliminate cycle stack loss by an automatic shut-off which closes down 80% of the equivalent cross-sectional flue area and by-passes draft away from furnace. During the burning operation, it provides a new type baffling action which properly proportions the effective cross-sectional area of the flue pipe with the intake of secondary air. Unit replaces a section of the flue pipe. Installations can be made in horizontal, vertical or elbow arrangements with the electric control unit mounted overhead.
SIZES AND CAPACITIES — Available in 6 sizes to correspond to standard flue pipe dimensions.
MADE BY — *Engineering Products Co., Philadelphia, Pa.*

Item E193

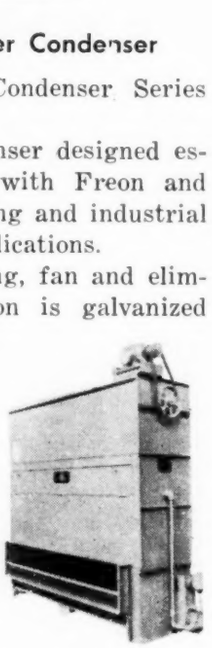
Super-Light Insulation

NAME — Super-Light 85% magnesia insulation.
PURPOSE—Improved type of heat insulation.
FEATURES—Material is a mixture of not less than 85% basic hydrated carbonate of magnesia and 10 to 15% asbestos fiber. The difference between this and the filter molded type starts in the manufacture where a radical departure in the kind of chemical procedure is followed. Makers claim that with this new process, the insulation maintains dimensional stability in the wet state, the shrinkage percentage is practically negligible, and the strength-weight ratio is much greater. Material has a density from 9.5 to 10.5 lb per cu ft as compared with 13 to 17 lb per cu ft in the filter molded type. Both the interior and exterior surfaces are smooth, resembling a troweled finish coat of plaster. Because this material is lighter, sections can be made larger so that, for example, two pieces of semi-cylindrical insulation can be used to go around an 18-inch pipe as against the former method which requires 11 small blocks.
MADE BY—*Philip Carey Manufacturing Co., Cincinnati, Ohio.*

Item E194

Niagara Blower Condenser

NAME—Niagara Condenser Series 5800.
PURPOSE — Condenser designed especially for use with Freon and for air conditioning and industrial refrigerating applications.
FEATURES — Casing, fan and eliminator construction is galvanized steel. Condensing coils for Freon are copper tube, with copper fin or hot galvanized steel tube and fin. Weatherproof construction for outdoor installation is available. Operating on the evaporative principle, the condenser is said to save 95% of the condensing water required by the shell and tube condenser method, and since it replaces both conventional condenser and cooling tower, its first cost as well as operating cost is low.



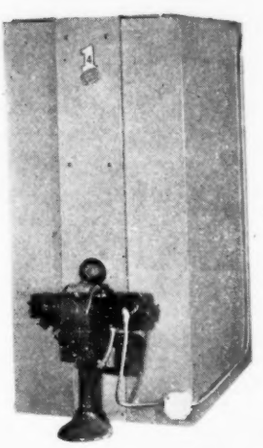
SIZES AND CAPACITIES—Five units ranging in capacity from 10 to 50 tons of refrigeration at 105F Freon condensing temperature. Smallest unit measures 31 by 24 by 85 inches and the largest 94 by 30 by 93 inches.
MADE BY — *Niagara Blower Co., New York, N. Y.*

Item E195

J & C Budget Furnace

NAME — Four-in-One budget furnace.
PURPOSE — Heating unit designed for either gas or oil, capable of taking on additional heating capacity to provide for enlargement of a home.
FEATURES—Winter air conditioning unit requires only the addition of a component package to make it either an 85,000, 100,000, 112,000, or 120,000 Btu per hr output furnace. This permits the heating system to grow as the home is expanded in size. Two 15- x 25-inch replacement type filters are used. Blower delivers from 1,070 to 1,500 cfm against 0.2 inch static, dependent upon the model used. The heater consists of one piece, 12-gage steel combination chamber with all joints welded and gas-tight. With the oil burner model, controls include combination fan and limit control, primary control, thermostat, and barometric damper. With the gas-burning unit, controls consist of combination fan and limit control, automatic pilot, automatic gas valve, pressure regulator, main and pilot shut-off.
MADE BY—*Jackson & Church Company, Saginaw, Mich.*

Item E196



Cadet Unit Heater

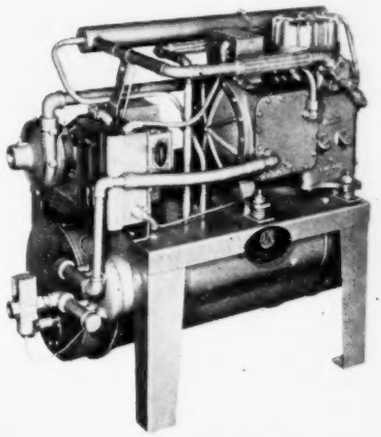
NAME—Cadet gas unit heater.
PURPOSE — Small suspended gas heating unit for space heating.
FEATURES—This small, suspended,

gas heating unit is claimed to have all the automatic features and quality of the forced circulation type of unit heater. It is manufactured for housing projects, apartments, offices, and shops. It is geared to pick up and distribute maximum heat from its specially designed heat exchanger. At higher speed, it moves large masses of air for summertime circulation. When the switch is turned to winter position, the automatic fan control is brought into synchronization with the operating cycles of the heater.
SIZES AND CAPACITIES—18¾ inches wide by 22½ inches high and 11⅜ inches deep. Output, 25,000 Btu per hr.
MADE BY—*Reznor Manufacturing Co., Mercer, Pa.*

Item E197

Acme Flow-Cold

NAME—Acme Flow-Cold.
PURPOSE—For residential or commercial air conditioning and for cooling process water.
FEATURES—Unit is completely assembled at the plant. When installed it only requires liquid and electrical connections. Unit uses a sealed compressor motor of the direct-connected hermetic type. A circulating pump is provided for external heads of 10 to 15 ft ranging between 3 and 4 gpm of water per ton of refrigeration. To provide the proper refrigerant and water velocity, direct expansion shell and tube chillers are standard on all models. A combination high and low pressure refrigeration control is built into each compressor circuit to stop the compressor in case of excessive head pressure or low refrigerant temperatures. Separate motor starters control compressor and pump motors. Heat exchanger is internally finned, designed for counterflow. On special flooded units, it is built into the chiller. Two shell and coil type condensers are used on the 10 and 15 hp models to permit separate refrigerant circuits for each compressor.
SIZES AND CAPACITIES — Available



in six models ranging from 2 to 15 hp.
LITERATURE AVAILABLE — Bulletin 50A.
MADE BY—*Acme Industries, Inc., Jackson, Mich.*

Item E198

Metal Treatment

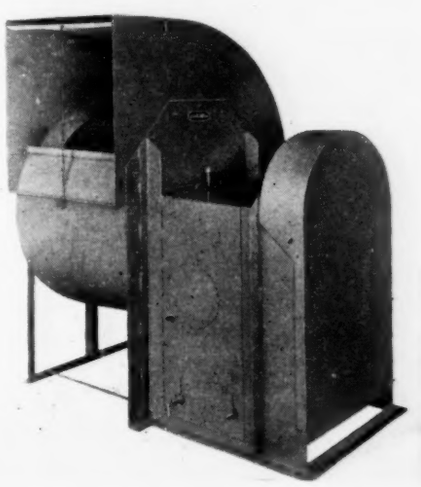
NAME—Poly-Kote.
PURPOSE—Compound for the treatment of iron and steel preparatory for painting.
FEATURES — Paint eliminates the need for treating metal with chromic acid. It is said to form a dense smooth film of low porosity and high plasticity which cannot absorb paint excessively. Crystalline coating can be controlled to provide a light or heavy paint-bonding film. Salt spray tests show, it is claimed, superior resistance to rusting both on painted and unpainted work. Immersion or spray application works equally well. It is non-toxic and non-inflammable.
MADE BY—*Kelite Products, Inc., Los Angeles 54, Calif.*

Item E199

U. S. Airco Ventilation

NAME—U. S. Airco ventilating set.
PURPOSE — Ventilating system for schools, apartments, offices, hospitals and factory buildings.
FEATURES—The new Vari-Flo control, especially designed for this model, permits easy adjustment of air volume over a large range while maintaining efficiency. No changes or additions are necessary to install it outdoors. Motor and bearings, which are completely housed, are cooled by air drawn in through a slot in the bottom of the belt-guard and discharged by the blower through an outlet in the fan housing. Simpler construction and fewer parts result in a unit more rigid than before and with fewer maintenance problems. Other features include easy access to motor and bearings; long-life, self-aligning sleeve bearings; easily-changed universal discharge, giving a choice of 8 different positions of the housing; sleeve-type inlet for easy connection to ventilating duct; and vibrationless motor mount.
SIZES AND CAPACITIES—From 800 to 1,800 cfm at various speeds and pressures.
MADE BY—*U. S. Air Conditioning Corp., Minneapolis, Minn.*

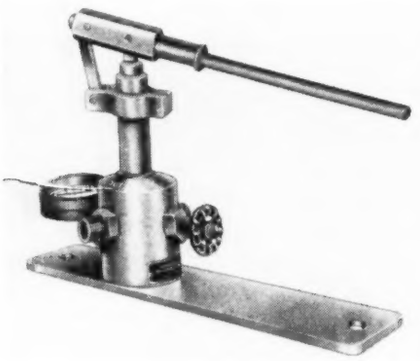
Item E200



Capitol Test Pump

NAME — Hydrostatic test pump, Model 6-V.

PURPOSE—For building up hydrostatic pressure to permit test for



leaks in radiant heating systems, other piping systems, or vessels.

FEATURES — A standard ¾-inch hose intake connection is provided for filling the system with water. Discharge fitting is ¾ inch I.P.S. Pump is self-contained with all the check valves enclosed in 3-inch round high tensile aluminum bar stock body. Shut-off valve in base of pump locks the pressure in system in accordance with gage indicating pressure. It will test to 1,000 lb pressure.

MADE BY—*Capitol Machine Works, 424 7th St., Oakland, Calif.*

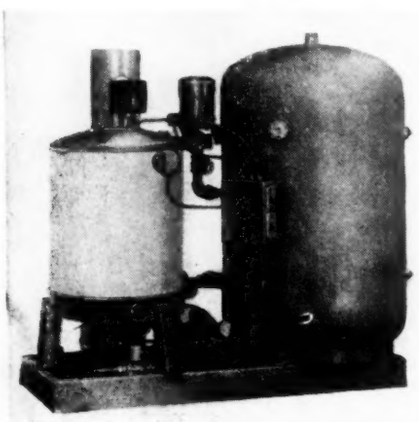
Item E201

Clayton Water Heater

NAME — Clayton industrial water heater.

PURPOSE—Industrial water heater capable of delivering large quantities of hot water.

FEATURES—Utilizing a high velocity, forced circulation principle, the



water heater has a guaranteed thermal efficiency of 75%, oil or gas fired. All controls are fully automatic, including a high-temperature safety cut-off. Simultaneous delivery of hot water at two different temperatures is obtained by means of a special blending assembly. The 140-gallon, fully insulated storage tank is an integral part of the unit. No erection equipment is necessary. The heater is delivered complete with automatic controls, circulating pump, burner, and safety valve, ready to operate after being connected.

SIZES AND CAPACITIES — Delivers 600 gph at 80F temperature rise. Heater stands 5 ft high, and requires a space 5 by 3 ft.

MADE BY—*Clayton Mfg. Co., El Monte, Calif.*

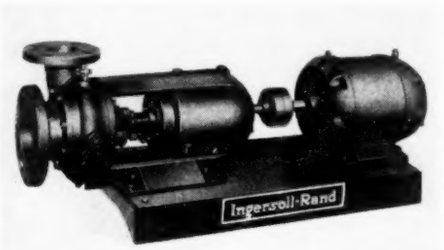
Item E202

Ingersoll-Rand Pump

NAME — Ingersoll-Rand cradle-mounted centrifugal pump.

PURPOSE—Pump, flexible in operation, for use in building work and process plants.

FEATURES—Features of the pump



include deep water-cooled stuffing box, smothering gland, ring oil-lubricated ball bearings, a heavy cradle shaft and bearing, sturdy channel steel baseplate, and an all-metal coupling. Impeller is mechanically and hydraulically balanced. Stuffing box accommodates 5 or more packing rings and, due to the side-opening cradle, it is easily accessible. Pump may be driven by direct electric motor; electric motor and V-belt; turbine through reduction gears; direct turbine; V-belt gasoline engine or direct gasoline engine.

SIZES AND CAPACITIES—Made in 5 sizes in both single and two-stage models. Sizes range from ¾ to 5 inches discharge with capacities up to 1,600 gpm, heads up to 250 ft and a normal horsepower range from ¼ to 75.

MADE BY — *Ingersoll-Rand Company, Cameron Pump Division, Phillipsburg, N. J.*

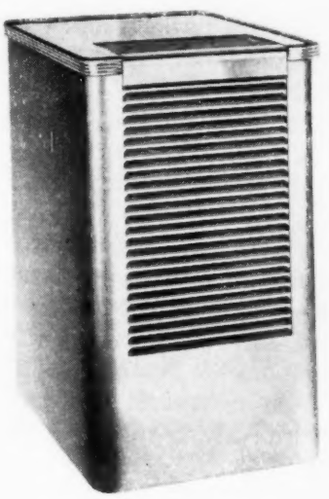
Item E203

Carrier Humidry

NAME—Carrier Humidry.

PURPOSE—Compact dehumidifying unit for installation in small establishments.

FEATURES—Humidry is a compact, semi-portable machine that oper-



ates on a refrigeration principle. Under room conditions of 80F and 70% relative humidity, it is capable of removing 18 pints of water from the air every 24 hours. The warm, humid air is drawn by the fan over the chilled surface of the solder-dipped copper evaporator coil. Moisture from the air is condensed and collected on the coil and drained away. The cool air then passes over the warm condenser surface by forced circulation from the pressed steel fan and is recirculated around the room. A drip pan under the evaporator catches the condensed moisture. A spout is available for a rubber hose connection so that the water can be conducted to a floor drain.

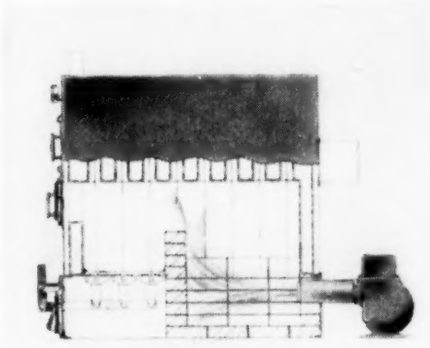
MADE BY—*Carrier Corp., Syracuse, N. Y.*

Item E204

Reliance Boiler

NAME—Smith-Mills Reliance oil-burning boiler.

PURPOSE—Oil-burning boiler provided with means for burning coal,



coke or wood, in case of temporary power failure.

FEATURES—Boiler has grates on the front end and provisions at the rear end for a combustion chamber for the oil burner, stoker or gas burner. During normal operation, grates are covered with insulation board to prevent air leakage. Should a power failure occur, this board is removed and a fire built on the grate. The available grate is of sufficient size to burn solid fuel necessary to maintain livable conditions in the house. Immediately after the power has been restored, normal burning operation can be resumed.

SIZES AND CAPACITIES — Available in 8 sizes for steam and 8 for water heating with oil-firing rates from 2.4 to 6.4 gph.

LITERATURE AVAILABLE—Bulletin.

MADE BY—*H. B. Smith Co., Inc., Westfield, Mass.*

Item E205

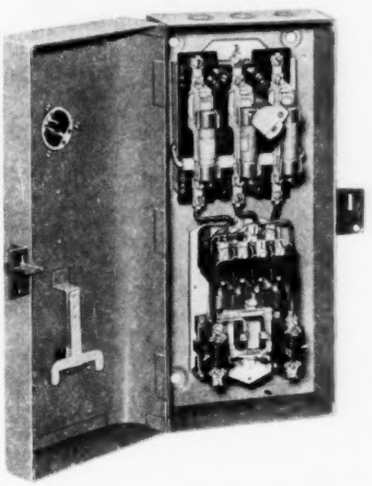
Ward Leonard Starter

NAME—Bulletin 4120 A. C. combination magnetic starters with disconnect switch.

PURPOSE — Compact motor starter for industrial and commercial use where a magnetic full voltage starter coupled with disconnect means at starter location is preferred.

FEATURES—Starters with fusible disconnect switches fulfill N.E.C. requirements for motor branch circuit over-current protection, disconnecting means, motor running over-current protection, and motor starter. Non-fusible starters meet these same requirements except for motor branch circuit protection. Components conveniently arranged in NEMA Type 1 general purpose enclosures are internally prewired and completely accessible. Starters feature: Front operation, maximum safety, simplified installation, thermal overload protection, high arc interruption capacity, provision for padlocking in "On" and "Off" position and interlock protection in "On" position.

SIZES AND CAPACITIES—Four standard sizes to 50 hp. Operating coils can be supplied for 110, 220, 440



and 550-volt on frequencies of 25, 50 or 60 cycles.

LITERATURE AVAILABLE — Bulletin 4120.

MADE BY—*Ward Leonard Electric Co., Mt. Vernon, N. Y.*

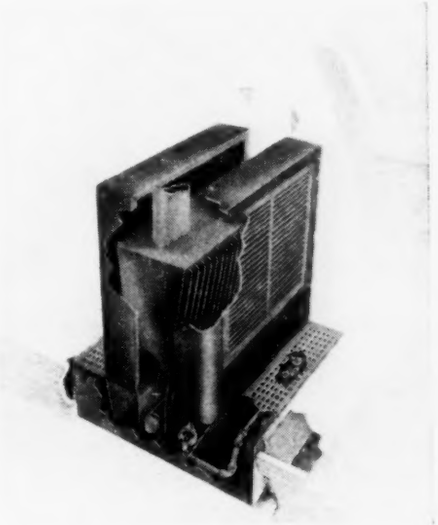
Item E206

Radivector

NAME—Radivector.

PURPOSE—Heating unit which combines the features of a floor furnace, dual furnace and also a wall heater.

FEATURES — Requiring only 10 inches of floor depth, unit is easy to install in a concrete slab construction, since all connecting and servicing is done from above. It is approved for second floor installation by AGA. The design provides for placement of an upward sloping ribbed heating element together with the return air grilles in the floor. Controls are located under the floor grille and are easily connected and serviced. Burner and



control assembly may be installed from either side.

SIZES AND CAPACITIES—45,000 Btu input.

MADE BY — *Radivector, Inc., Los Angeles 39, Calif.*

Item E207

Cam-Stat Thermostat

NAME—Cam-Stat.

PURPOSE—A water heater thermostat.

FEATURES — Control offers double-break contacts, provided with hammer action. It is protected from damage by opposite polarity. Temperature range is 60-180F with ratings of 6,000 watts at 240 volts a-c. Unit is available in both single pole, single throw and single pole, double throw models. Brackets will be furnished to specifications.

SIZES AND CAPACITIES — Measures 5½ by 2¾ inches and weighs 4 oz.

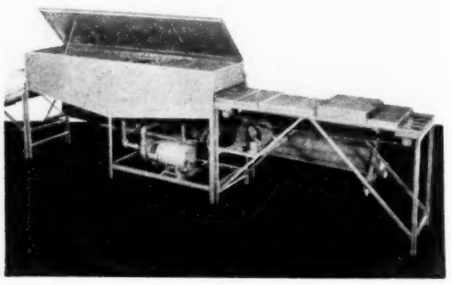
MADE BY—*Cam-Stat, Inc., Los Angeles, Calif.*

Item E208

Farr Filter Washer

NAME—Far-Air utility washing unit.

PURPOSE—Washing unit for cleaning impingement type filters.



FEATURES—A new utility washing and oiling machine for servicing viscous, impingement, panel-type air filters is a modified version of previous models. It is claimed that use of the washer and oiler reduces air filter maintenance costs as much as 67%, substantially increases filter life, assures positive oiling, and permits lower inventory stock. Unit can easily be operated by an inexperienced man because all controls are automatic.

SIZES AND CAPACITIES—For handling filters up to 20 by 28 by 4 inches.

MADE BY—*Farr Company, Los Angeles, Calif.*

Item E209

Cochrane Water Softener

NAME—Cochrane hot process zeolite water conditioner.

PURPOSE—Process of softening industrial water combining action of the hot process softener and the zeolite softener.

FEATURES—The zeolite softener is used as a second stage following the first stage in which lime is the single reagent. This first stage precipitates the bicarbonates and magnesium in the water supply leaving the remaining hardness to be removed by the zeolite softener, utilizing salt as a regenerant. New high temperature resins used in the zeolite stage will withstand both the high temperatures and the pH values obtained in the hot process stage. Only one chemical is needed in the hot process. The softener is claimed to be advantageous in the treatment of turbid surface water high in carbonate hardness and silica. It combines economical softening, silica removal, and clarification in one apparatus.

MADE BY—*Cochrane Corporation, Philadelphia, Pa.*

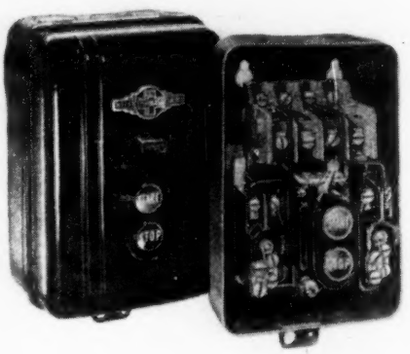
Item E210

Furnas Motor Control

NAME—Furnas magnetic starter.

PURPOSE—Starter for electric motors.

FEATURES — Starter is furnished with dual voltage coils, with or without built-in pilot controls, and general purpose or water-tight enclosure. The recently developed



Switchlet, quickly attached to either side of the starter, provides a means for adding extra circuits. Movable contact bridges are phosnic-bronze and slide on guides made of hard stainless steel. Pilot control may be push-button or selector switch, available either as a built-in control or in a compact separate case for remote control.

SIZES AND CAPACITIES—5 hp, 220-volt a-c; 7½ hp, 440- to 550-volt a-c.

LITERATURE AVAILABLE — Catalog 50.

MADE BY — *Furnas Electric Company, Batavia, Ill.*

Item E211

Vaporseal Coating

NAME—Insul-Mastic vinyl system of coating.

PURPOSE—A vaporseal coating to be placed over semi-rigid insulation as protection against the elements.

FEATURES—This vinyl coating is sprayed over the insulation as a base for the protective mastic coating to form an impervious cover. This coating is flexible and the makers claim that it will not crack. It will withstand expansion and contraction of the vessel being insulated.

MADE BY—*Insul-Mastic Corporation of America, 1141 Oliver Building, Pittsburgh 22, Pa.*

Item E212

Coral Electronic Switch

NAME — Coral 110 electronic time switch.

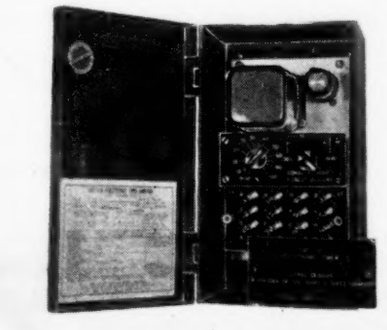
PURPOSE — For automatic timing and programming operations.

FEATURES—Timing periods of 1/20th second to 4 minutes can be obtained, it is said, with an accuracy variation of less than plus or minus 2%. This is accomplished by a selector switch and intermediate time variable resistor. Although supplied with a housing, it can be obtained as a panel mounted unit. The semi-sealed transformers have drawn steel cases. The timing capacitor is hermetically sealed and has glass type terminals. One electronic tube is used in this unit. The single relay has a dual coil which is sealed against humidity. Units are supplied for use with either 115- or 230-volt, 50 to 60 cycles.

SIZES AND CAPACITIES—Ratings of 10 amperes to 115 volts a-c and 5 amperes, to 230 volts a-c, non-inductive load.

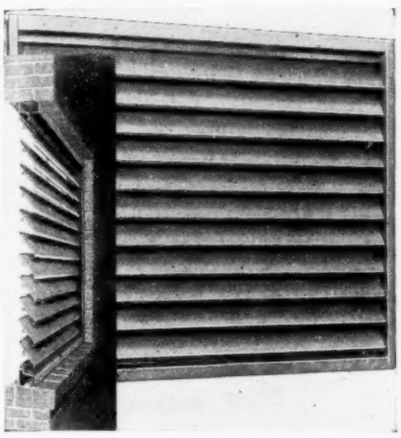
MADE BY—*Coral Designs, Division of The Henry G. Dietz Co., Forest Hills, N. Y.*

Item E213



Swartwout Louver

NAME—Airlouver.
PURPOSE—Louver for installation in industrial and commercial buildings.
FEATURES—Heavy duty frame and



overlapping blades, weatherproof in both open and closed positions, are fabricated under a flexible set-up permitting almost unlimited selection of sizes. By varying the number of blades used, and cutting the frames to suit width requirements, any size wall opening can be fitted with equal-size units. Unit is made in adjustable and fixed types. While galvanized steel is the standard material used, fabrication can be of copper, aluminum, monel or A.P.M.
SIZES AND CAPACITIES—Wide range of sizes from 11⅞-inch high by 12-inch wide to 74¾- by 48-inch.
LITERATURE AVAILABLE — Bulletin 339.
MADE BY—*The Swartwout Company, 18511 Euclid Ave., Cleveland 12, Ohio.*

Item E214

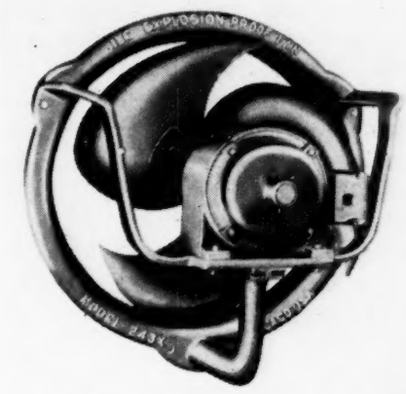
Silver Brazing Rings

NAME—No-tangle notched coil silver brazing and soldering rings.
PURPOSE—Silver soldering rings designed to prevent distortion and greater ease in handling.
FEATURES—Notched feature is said to reduce assembly time by 10%. Stress-relieving treatment prevents rings from distorting or creeping when heat is applied. Makers claim rings maintain a tolerance of .001 inch in actual ring diameter. Only measured amounts of the solder alloy are used and a joint of more uniform appearance results. Silver rings break from the coil at the notches. Rings are made to customer's specifications.
MADE BY—*Lucas-Milhaupt Engineering Co., 5057 South Lake Dr., Cudahy, Wis.*

Item E215

Ilg Explosion-Proof Fan

NAME—Ilg Series X explosion-proof fan.
PURPOSE—Explosion-proof propeller fan for class I, group D hazardous locations.
FEATURES—Unit combines performance features of the Ilg Type Q propeller fan and the ball bearing explosion-proof motor. The aluminum type propeller fan wheel is

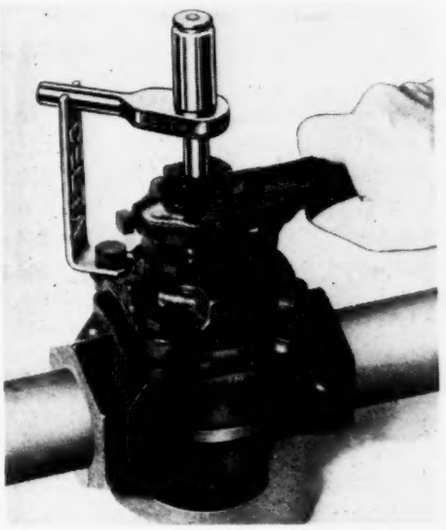


dynamically balanced for smooth operation. Cast aluminum fan frame has streamlined air inlet for smooth efficient air flow. Models are suitable for static pressures up to ½ inch.
SIZES AND CAPACITIES—8 models available with 1-phase and 3-phase motors. All sizes are suitable for either horizontal or vertical operation.
MADE BY—*Ilg Electric Ventilating Co., Chicago, Ill.*

Item E216

Delta Plug Valve Lubricator

NAME—Delta automatic plug valve lubricator.
PURPOSE—Device for automatically lubricating any make of lubricated plug valve from ½- to 20-inch size.
FEATURES — Lubricator forces a measured amount of lubricant into the lubricating channels of the valve each time it is opened and closed. It is claimed to be foolproof and positive in action. Unit is com-



posed of three simple stainless steel parts, easily attached without making any alteration on the valve. Valve may be opened and closed 50 to 100 times before the reservoir must again be filled. To reset and refill with lubricant takes only a few seconds. The hose connection is snapped on the top fitting, the plunger handle is given a few strokes, and the reservoir is filled.
MADE BY—*Delta Engineering Sales Co., 806 Louisiana Avenue, Shreveport, La.*

Item E217

Fluid Covering

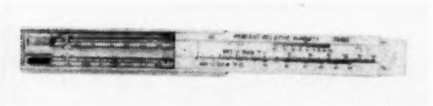
NAME—Savinoleum.
PURPOSE—Fluid application of a plastic covering for wood, stone, metal, and other surfaces.
FEATURES—Material is said to be resistant to water, soap, salt-water, grease, alkali, gasoline and heat and to be able to maintain its high lustre. This paint-like material flows on easily and covers any uneven imperfections to provide the appearance and feel of tile. It can be applied by brush or spray. Coating is available in 14 colors and is said to dry in 4 to 12 hours.
MADE BY—*Pavinoleum, Inc., New York, N. Y.*

Item E218

Tag Humidity Indicator

NAME—Tag Pocket Humidicator, Model 8704.

PURPOSE—A pocket type instrument for easily determining the relative humidity.



FEATURES—Instrument can be used either in the hand or mounted on a wall. A simple built-in slide-rule converts wet bulb and dry bulb readings into relative humidity. Unit consists of two etched scale glass thermometers, individually hand calibrated for permanently accurate readings. These are secured in a sturdy white plastic case by integral resilient mountings. The psychrometric slide-rule forms the cover of this case. For use, a few drops of water are applied to the thermometer wick, and the instrument is fanned or swung for several moments. Setting the wet bulb reading opposite the dry bulb reading on the slide-rule then indicates relative humidity without any computations.

MADE BY—*Weston Electrical Instrument Corporation, Newark 5, N. J.*

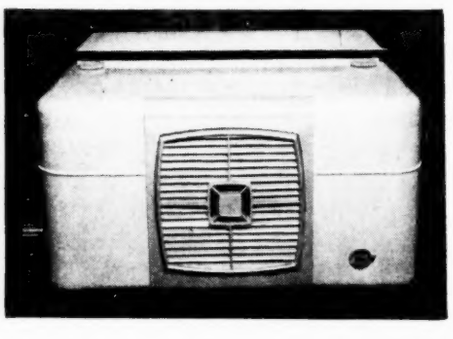
Item E219

Airtemp Room Conditioner

NAME—Airtemp room air conditioner.

PURPOSE—Space cooling.

FEATURES — No plumbing connections are required and the conditioner operates from standard 110-volt current. The hermetically sealed compressor carries a five-year manufacturer's warranty. Conditioner has a four-way adjustable grille. A center knob controls the air flow. An outdoor fresh air intake provides year 'round ventilation. Outside air can be drawn into the room without cooling.



SIZES AND CAPACITIES—Two models available—the ½ hp model is rated at 6,000 Btu per hour and the ¾ hp model, 8,500 Btu per hour.

MADE BY — *Airtemp Division, Chrysler Corp., Dayton 1, Ohio.*

Item E220

Polyken Coating

NAME—Polyken Coating.

PURPOSE—A single material pipe coating for protection against corrosion.

FEATURES—The protective coating is a polyethylene film with a synthetic adhesive applied to one side. This plastic is said to have excellent electrical and mechanical resistance properties. Because of its elasticity of material, permanent pressure is said to be maintained around the pipe equal to the tension exerted when the tape is applied. Tape is available in various widths on 1½- and 3-inch cores, and also in black and aluminum colors.

DISTRIBUTED BY—*Plastic Engineering and Sales Corporation, Fort Worth, Texas.*

Item E221

Air Cooler

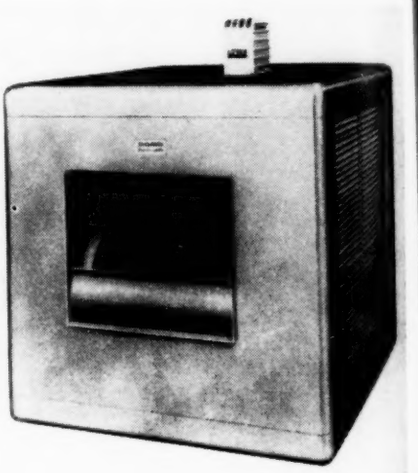
NAME — De-Hu-Matic evaporative air cooler.

PURPOSE—Air cooler which makes possible the automatic adjusting of evaporation rate with temperature change.

FEATURES—The cooling surface is divided into five zones which are automatically wetted, one by one, as the dry bulb temperature increases. Water flow to the mats is controlled by a valve actuated by a bellows responsive only to dry bulb temperature. Another bellows responsive only to wet bulb temperature acts as a safety valve to shut off water supply to the mats as humidity rises above comfort level. This evaporation control enables the unit to cool without dampness. It provides a complete air change every one or two minutes. Unit is said to be easy to install and to operate at low cost.

MADE BY—*U. S. Air Conditioning Corp., Minneapolis, Minn.*

Item E222



New Equipment Briefs

Cellufoam, a new insulation product, has been developed for application in air conditioning systems, where a greater degree of flame-resistance is considered desirable. ..... **Item E223**

A new industrial rubber glove is made with a roughened surface as part of the glove, to insure a firm tight grip. The glove, which has curved fingers, comes in sizes 9, 10 and 11. It has a strong finger crotch and is said to have excellent snag resistance. ..... **Item E224**

Carbon bearings are available for temperatures up to 800F without lubrication. They have the ability, it is claimed, to function at high speeds and under heavy loads. This self-lubricating material is applicable to seals, rings, slides and valves. ..... **Item E225**

A stainless steel body is now used in place of the cold-rolled steel cadmium-plated body previously furnished for Yarway impulse steam trap design for working pressures up to 400 lb and temperatures up to 450F. Body is now made of Type 416 stainless steel. ..... **Item E226**

PRODUCT INFORMATION SERVICE

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NEW CATALOGS

ELECTRIC WELDED PIPE—A 20-page booklet on pipe made by the electric resistance weld method describes the manufacturing process and includes tables of weights, dimensions and hydrostatic test pressures. Structural and mechanical applications are included.—Republic Steel Corp., Cleveland, Ohio. **Item C105**

BLOWERS—A 4-page bulletin, No. 88, gives dimension and capacity data on Standardaire blowers.—The Standard Stoker Co., Inc., New York, N. Y. .....**Item C106**

INDUSTRIAL VENTILATION GUIDE—A new industrial ventilation guide prepared by the Propeller Fan Manufacturers Association provides information on industrial ventilation problems and solutions.—Propeller Fan Manufacturers Association, Detroit, Mich. **Item C107**

CENTRIFUGAL PUMPS — Bulletin W-318-B21 covers two-stage, double suction centrifugal pumps. A selection chart shows capacity range of various models at various heads.—Worthington Pump and Machinery Corp., Harrison, N. J. .....**Item C108**

CEILING DIFFUSER OUTLETS — Venturi-Flo ceiling outlets for air diffusion are covered in a 12-page catalog No. F-4085. Data tables indicate throw of various models and air handling capacities. Returns and accessories are included.—Barber-Colman Co., Rockford, Ill. .....**Item C109**

INSULATING MATERIALS—An 8-page, 2-color booklet covers selection of asbestos and other insulating products for pipe covering and other applications. Products include air cell asbestos, magnesia, felt, asbestos paper and cement. Pricing tables are included.—Grant Wilson, Inc., Chicago, Ill. .....**Item C110**

GAS UNIT HEATERS — Pittsburgh gas unit heaters featuring cast iron heat exchangers are described and illustrated in a 4-page folder. Output ratings range from 70,000 to 178,000 Btu per hour.—Automatic Gas Equipment Co., Pittsburgh, Pa. .....**Item C111**

FLOW RATE INDICATORS — The Selas Flo-Scope flow rate indicators for air and gas are covered in an 8-page bulletin with diagrams, installation photographs, and selection tables for handling various gases.—Selas Corp. of America, Philadelphia, Pa. .....**Item C112**

BASEBOARD HEATING — A 34-page booklet covers baseboard heating with U. S. radiant baseboard with installation photographs, a discussion of radiation and convectoin principles, and installation techniques. Floor plans and capacity charts are given.—U. S. Radiator Corp., Detroit, Mich. .....**Item C113**

WELDING FITTINGS — Seamless carbon steel welding fittings and forged steel flanges are covered in an 88-page catalog WF-1950. Cross sections and diagrams of fittings with dimensions, wall thicknesses, schedule number, and prices for elbows, returns, tees, crosses, reducers, and other welding fittings for piping are included.—Grinnell Co., Inc., Providence, R. I. .....**Item C114**

PIPING FLEXIBILITY DATA—Expansion and flexibility of piping are covered in section 4.01 of the Tube Turns Piping Engineering series of technical folders. Basic principles of expansion and stress are covered as well as piping codes and rules, expansion stress calculations, etc. — Tube Turns, Inc., Louisville, Ky. .....**Item C115**

COMFORT COOLING—A second edition of a 32-page manual on home cooling covers cooling and ventilating problems in residential, commercial and industrial buildings. Basic design data for each class of construction are included. A special section covers farm buildings.—Hunter Fan and Ventilating Co., Memphis, Tenn. .....**Item C116**

AXIAL FLOW FANS—A 12-page, 2-color catalog covers Emerson home cooler fans, including attic fans, window fans, and kitchen exhaust fans.—The Emerson Electric Mfg. Co., St. Louis 21, Mo. .....**Item C117**

STEAM TRAPS — Catalog 250 describes the Nicholson line of steam traps. Thermostatic, expansion, and weight-operated traps are described and illustrated with diagrams, capacity and sizing tables.—W. H. Nicholson & Co., Wilkes-Barre, Pa. .....**Item C118**

CONTROL CONNECTING LINKAGE — General specification CA942 describes the Bailey control linkage. This 16-page brochure contains information necessary for choosing and ordering correct material and arrangement to suit various applications.—Bailey Meter Co., Cleveland 10, Ohio. .....**Item C119**

MODULATING OUTDOOR CONTROL—Supplementary Bulletin ST-501 covers Sarcotherm modulating outdoor controls. Additions to the line include manual adjustment features, full heat switch, morning pickup and night setback.—Sarcotherm Controls, Inc., New York 1, N. Y. .....**Item C120**

FREON—Technical Bulletin B-2 describes the Freon line of fluorinated hydrocarbons used as refrigerants, propellants and a wide variety of other applications.—Kinetic Chemicals, Inc., Wilmington, Del. .....**Item C121**

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INSULATION HARDBOARD—Design Data Book RBH-1-50 covers the use of the Rubatex insulation hardboard for low temperature insulation. Sample calculations, heat transfer charts and other design data are included.—Rubatex Division, Great American Industries, Inc., Bedford, Va. .....**Item C122**

SPRAY NOZZLES—Catalog No. 30 covers spray nozzles and accessories for industrial and air conditioning applications. Recommended uses, spray characteristics, and construction features are detailed.—Industrial Div., Delavan Mfg. Co., Des Moines, Iowa. .....**Item C123**

TURBINE UNIT HEATERS — Wing turbine driven unit heaters are featured in a new bulletin. Operating without electric motors, fan is driven by a steam turbine, exhaust from which is piped into the heating section. Construction detail and engineering data are included. — L. J. Wing Manufacturing Co., Linden, N. J. .....**Item C124**

PACKAGED AIR CONDITIONERS—A 12-page, 2-color catalog, No. PM 79-0100, has the GE line of packaged air conditioners in 2, 3, 5, 7½ and 10 hp capacities suiitable for applications in homes, stores, etc.—Air Conditioning Department, General Electric Co., Bloomfield, N. J. .....**Item C125**

MAINTENANCE BULLETIN—Maintenance of electrical machines and other rotating equipment is covered in a series of articles by Fraser Jeffrey, Allis-Chalmers engineer, in a 24-page booklet, No. 05R7417. —Allis-Chalmers Mfg. Co., Milwaukee, Wis. .....**Item C126**

WELDING FITTINGS PRICE LIST—A stainless steel welding fittings price list (52W) covers elbows, return bends, tees, etc., in various stainless steel alloys.—The Cooper Alloy Foundry Co., Hillsside 5, N. J. .....**Item C127**

STIC-KLIP APPLICATION DATA—Application of Stic-Klips, patented devices for fastening insulation on surfaces, are set forth in Bulletin No. 2 covering the insulation of heating, ventilating and air conditioning and industrial processing equipment. Drawings and diagrams illustrate fastening methods for various insulation and sound absorption applications.—Stic-Klip Manufacturing Co., Cambridge 40, Mass. .....**Item C128**

PRESSURE REDUCING VALVES—Bulletin No. 283 includes additions to the Cash-Acme line of pressure reducing and regulating valves. Bulletin also announces a new automatic reseating relief valve. Selection tables and prices are included.—A. W. Cash Valve Mfg. Corp., Decatur 60, Ill. .....**Item C129**

WEATHER ACTUATED THERMOSTAT—Weather-Chron, a weather actuated day-night time switch installed on the outside of buildings for regulating heating systems is described in Bulletin D-149. Function, operation and applications are covered with installation diagrams and photographs.—Automatic Devices Co., Chicago, Ill. .....**Item C130**

AUTOMATIC CONTROL EQUIPMENT—Zenith automatic control equipment including contactors, switches, timers, clocks, and starters are described in a looseleaf bound folder.—Zenith Electric Co., Chicago 10, Ill. **Item C131**

SCHOOLROOM VENTILATION—A new booklet "37 Points of Engineering and Functional Superiority" describes the advantages of the Herman Nelson system of classroom ventilation.—Herman Nelson Division, American Air Filter Co., Inc., Moline, Ill. .....**Item C132**

GRILLE SELECTOR SLIDE RULE—Available at no cost is a slide rule for rapid sizing of ventilating and air conditioning grilles. Grille size is based on noise level, air volume, throw, and ceiling height. Table of maximum allowable noise levels for different installations is printed on rule face. Range of variables is great enough for the selection of a grille for any common application.—Barber-Colman Co., Rockford, Ill. .....**Item C133**

STEEL PIPE PRICE DATA CARD—A new data card designed to help individuals involved in purchasing carbon steel pipe or estimating cost of apparatus using this material, is identified as TDC 135 and tabulates the present day prices per hundred feet of seamless carbon steel pipe 1½ inches in nominal diameter and smaller, in all quantity brackets.—Babcock & Wilcox Tube Co., Beaver Falls, Pa. .....**Item C134**

INSULATION CHART—A new alignment chart, designed to solve problems in prevention of surface condensation on piping or other carriers of cold liquid or gaseous material, shows minimum mineral wool insulation thickness required under various conditions of ambient temperature and humidity. Chart is a nomogram with diagrams, instructions, and formula matter included. — Industrial Mineral Wool Institute, New York 17, N. Y. .....**Item C135**

RADIATORS AND GRILLES—Air Control registers, grilles and assemblies for outlets from floor and wall furnaces, space heaters, and cooling units are covered in an 8-page bulletin with installation data.—Air control Products, Inc., Coopersville, Mich. .....**Item C136**

INSULATION GUIDE—The Ruberoid insulation guide is a thumb indexed bulletin describing applications of air cell insulations, cement, insulating blocks, wool felt, asbestos covering and other items in the Ruberoid line. Temperature range from 0 to 1900F is covered in data for the various products.—The Ruberoid Co., New York 18, N. Y. .....**Item C137**

REFRIGERATION FITTINGS—Refrigeration fittings and accessories are described and illustrated in a 20-page Bulletin, No. R-501. Specifications and prices on driers, strainers, charging lines, liquid indicators, check valves, and accessory items are included. — Madden Brass Products Co., Chicago 10, Ill. **Item C138**

AUTOMATIC REGULATING VALVES—A float and lever valve selection chart may be used as a guide to pressure drop, maximum temperature, operating means, and service applications of various types of regulating valves. Valves are illustrated on reverse of chart.—Klipfel Valves, Inc., Division of Hamilton-Thomas Corp., Hamilton, Ohio. .....**Item C139**

RESIDENTIAL GLASS BLOCK PANELS—A new and simplified method of erecting small residential panels of glass blocks, which does away with the use of the structural accessories that are necessary for large panels, and which can be applied if the panel to be erected is 25 sq ft or less in total area, and the height no more than 7 ft, or the width no more than 5 ft, is described in a new booklet, "Beauty Spots For Your Home."—Pittsburgh Corning Corporation, 307 Fourth Ave., Pittsburgh 22, Pa. .....**Item C140**

THERMOMETERS—Catalog 16 offers complete specifications for 80 different commercial thermometers for a wide variety of temperature measurements including: indoor, outdoor, household oven, household refrigeration, candy-making, deep fat frying, cooking vat, incubator, brooder, refrigerator car, maple sugar, domestic hot water, refrigeration line, steam, hot oil, airduct, diesel engine and general testing. Completely illustrated. Retail price list is included.—H-B Instrument Co., 2633 Trenton Ave., Philadelphia 25, Pa. .....**Item C141**

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DEGREE-DAYS FOR APRIL, 1950

(A) Airport readings; (C) City office readings; (O) Readings at a point on outskirts of city.

HEATING AND VENTILATING'S 22nd Year of Publication of Monthly Degree-Day Data

City	April			Cumulative, September 1 to April 30			Heating Season[1]
	1950	1949	Normal	1949-50	1948-49	Normal	Normal
Abilene, Texas (A)	128	188	27	2189	2817	2061	2061
Albany, New York (A)	.....	494	549	.....	5876	6397	6580
Albuquerque, New Mexico (A)	195	299	288	3802	4574	4258	4298
Alpena, Michigan (C)	923	662	789	7411	6623	7662	8299*
Anaconda, Montana (C)	821	564	756	7725	8227	7493	8357**
Asheville, North Carolina (C)	368	322	330	3543	3453	4161	4232
Atlanta, Georgia (C)	217	180	132	2446	2364	2890	2890
Atlantic City, New Jersey (C)	525	408	519	4181	3959	4956	5176
Augusta, Georgia (A)	152	108	24	1850	1619	2161	2161
Baker, Oregon (C)	680	509	615	6607	7303	6519	7163
Baltimore, Maryland (C)	396	312	348	3819	3591	4511	4533
Billings, Montana (A)	665	362	534	7219	7269	6743	7119
Binghamton, New York (C)	663	530	594	6052	5563	6554	6808
Birmingham, Alabama (A)	211	164	69	2239	2285	2352	2352
Bismarck, North Dakota (A)	932	494	657	9623	8811	8809	9192
Block Island, Rhode Island (C)	632	537	633	4885	4616	5311	5788
Boise, Idaho (A)	517	349	435	5671	6296	5316	5552
Boston, Massachusetts (A)	539	423	570	5266	4787	5800	6045
Boseman, Montana (C)	730	509	731	7466	8012	7724	8521**
Buffalo, New York (A)	744	583	675	6193	5638	6475	6822
Burlington, Iowa (A)	606	440	(a)	5969	5955	(a)	(a)
Burlington, Vermont (A)	736	596	654	7259	6528	7238	7514
Butte, Montana (C)	825	610	741	7979	8757	7424	8235**
Cairo, Illinois (C)	277	218	201	3465	3431	3909	3909
Canton, New York (C)	747	614	684	7462	6720	7686	8020
Charleston, South Carolina (C)	128	59	36	1394	1165	1769	1769
Charlotte, North Carolina (C)	230	200	159	2687	2432	3120	3120
Chattanooga, Tennessee (A)	250	217	144	2872	2844	3118	3118
Cheyenne, Wyoming (A)	734	611	720	6538	7255	6894	7466
Chicago, Illinois (C)	670	506	518	5649	5358	5764	6077
Cincinnati, Ohio (C)	424	342	333	4094	3931	4684	4684
Cleveland, Ohio (A)	655	526	564	5580	5234	5935	6155
Columbia, Missouri (C)	454	338	303	4637	4740	4900	4922
Columbia, South Carolina (C)	168	137	63	2054	1760	2364	2364
Columbus, Ohio (C)	555	429	420	4867	4573	5311	5398
Concord, New Hampshire (A)	693	556	669	7004	6248	7001	7353
Concordia, Kansas (C)	484	345	342	5236	5688	5250	5315
Dallas, Texas (A)	132	128	9	2076	2473	2256	2256
Davenport, Iowa (C)	626	427	453	6009	5788	6171	6289
Dayton, Ohio (A)	594	478	396	5276	5041	5183	5264
Deer Lodge, Montana (C)	736	558	735	7682	8540	7860	8672**
Denver, Colorado (C)	515	435	534	4897	5701	5607	5874
Des Moines, Iowa (C)	616	431	441	6314	6223	6266	6384
Detroit, Michigan (A)	696	534	573	6060	5588	6264	6490
Devils Lake, North Dakota (C)	1007	592	756	10396	9545	9450	9970
Dodge City, Kansas (A)	423	371	342	4716	5392	4988	5035
Dubuque, Iowa (C)	694	471	489	6636	6318	6641	6790
Duluth, Minnesota (C)	1009	620	801	9138	8107	8746	9483
Eastport, Maine (C)	768	672	786	6914	6547	7398	8520**
Elkins, West Virginia (A)	586	542	501	5192	5047	5520	5697
El Paso, Texas (A)	42	152	45	2136	2930	2428	2428
Ely, Nevada (A)	672	569	(a)	6761	8173	(a)	(a)
Erie, Pennsylvania (C)	700	593	609	5545	5148	6016	6273
Escanaba, Michigan (C)	981	711	828	8053	7213	8118	8771
Evansville, Indiana (A)	425	345	276	4184	4154	4244	4244
Fort Smith, Arkansas (A)	207	185	93	3096	3250	3147	3147
Fort Wayne, Indiana (A)	669	514	474	5905	5515	5795	5925
Fort Worth, Texas (A)	123	124	27	2109	2438	2148	2148
Fresno, California (A)	104	39	135	2538	2733	2334	2334
Galveston, Texas (C)	30	60	0	653	993	1016	1016
Grand Junction, Colorado (A)	365	331	384	5423	6160	5430	5548
Grand Rapids, Michigan (C)	756	507	534	6204	5677	6361	6535
Green Bay, Wisconsin (C)	881	611	600	7936	7029	7503	7825
Greensboro, North Carolina (A)	300	288	210	3441	3213	3529	3529
Greenville, South Carolina (A)	237	221	195	2842	2601	3380	3380
Harrisburg, Pennsylvania (A)	513	420	405	4974	4686	5285	5375
Hartford, Connecticut (A)	575	445	531	5717	5200	5834	6036
Hatteras, North Carolina (C)	238	145	255	1869	1874	2571	2571
Havre, Montana (C)	712	398	630	8884	8369	8187	8700
Helena, Montana (A)	726	519	646	7983	8512	7261	7894**
Houston, Texas (C)	38	72	0	852	1196	1157	1157
Huron, South Dakota (A)	806	488	570	8215	7778	7737	8004
Indianapolis, Indiana (A)	575	442	384	5184	5018	5239	5298
Jackson, Mississippi (A)	155	105	(a)	1729	1805	(a)	(a)
Kansas City, Missouri (A)	433	315	306	4695	4847	4950	4956
Knoxville, Tennessee (A)	298	260	210	3125	3107	3670	3670
La Crosse, Wisconsin (A)	777	545	528	7800	7193	7139	7322
Lander, Wyoming (A)	690	493	690	7134	7998	7384	7947

(a) Data not available.

[1]Figures in this column are normal totals for a complete heating season, September to June, incl.

Figures in this table, with seven exceptions, based on local weather bureau reports. Exceptions are Utica and Lewiston, figures for which are furnished through the courtesy of Coke Sales Department, Central New York Power Corp., Utica, N. Y., and Norman E. Ross, Bursar, Bates College, Lewiston, Me., respectively; Anaconda, Bozeman, Butte, Deer Lodge and Livingston, Mont., through the courtesy of the Montana Power Company.

[Table concluded on page 114]

Degree-Days for April, 1950 (Concluded)

(A) Airport readings; (C) City office readings; (O) Readings at a point on outskirts of city.

HEATING AND VENTILATING's 22nd Year of Publication of Monthly Degree-Day Data

City	April			Cumulative, September 1 to April 30			Heating Season[1]
	1950	1949	Normal	1949-50	1948-49	Normal	Normal
Lansing, Michigan (A)	(a)	563	582	(a)	6098	6819	7048
Lewiston, Maine (O)	674	516	693	6924	6171	7318	7707
Lincoln, Nebraska (C)	542	358	417	5859	6193	5900	5999
Little Rock, Arkansas (A)	168	153	78	2693	2845	2811	2811
Livingston, Montana (C)	677	443	653	6741	7092	6638	7245**
Los Angeles, California (C)	89	85	159	1372	1784	1414	1504
Louisville, Kentucky (A)	388	327	264	3961	3892	4180	4180
Lynchburg, Virginia (A)	344	324	273	3763	3598	3980	3980
Macon, Georgia (A)	153	94	33	1786	1769	2201	2201
Madison, Wisconsin (C)	756	560	582	7058	6669	7193	7429
Marquette, Michigan (C)	972	641	804	8020	7189	7968	8693*
Memphis, Tennessee (A)	235	171	96	2834	2808	2950	2950
Meridian, Mississippi (C)	173	112	24	1877	1822	2160	2160
Milwaukee, Wisconsin (A)	767	606	648	6742	6356	6856	7245
Minneapolis, Minnesota (A)	834	539	570	8061	7449	7614	7850
Montgomery, Alabama (C)	141	89	0	1544	1509	1884	1884
Nantucket, Massachusetts (A)	680	565	639	5188	4933	5450	5957
Nashville, Tennessee (A)	312	257	180	3302	3210	3507	3507
New Haven, Connecticut (A)	604	467	543	5387	4931	5672	5895
New Orleans, Louisiana (C)	55	37	0	775	900	1024	1024
New York, N. Y. (C)	494	356	465	4439	4100	5073	5274***
Nome, Alaska† (A)	(a)	1463	1756	(a)	10881	12085	14580**
Norfolk, Virginia (C)	283	206	246	2674	2511	3350	3350
North Head, Washington (C)	533	486	516	4469	4641	4271	5452**
North Platte, Nebraska (A)	654	458	486	6345	6619	6167	6366
Oakland, California (A)	266	233	273	2782	3091	2665	3143**
Oklahoma City, Oklahoma (C)	208	204	162	3277	3691	3613	3613
Omaha, Nebraska (A)	559	374	414	6146	6277	6047	6131
Oswego, New York (C)	726	606	675	6307	5781	6668	7088
Parkersburg, W. Virginia (C)	440	391	351	4349	4186	4722	4775
Peoria, Illinois (A)	613	434	453	5816	5621	5988	6109
Philadelphia, Pennsylvania (C)	463	335	378	4200	3872	4605	4737***
Phoenix, Arizona (C)	9	36	0	1119	1818	1405	1405
Pittsburgh, Pennsylvania (C)	524	423	423	4720	4388	5157	5235
Pocatello, Idaho (A)	626	416	567	6477	7143	6263	6655
Portland, Maine (A)	718	585	666	6988	6296	6771	7218
Portland, Oregon (C)	425	307	402	4292	4377	4134	4469
Providence, Rhode Island (C)	539	386	558	5192	4602	5764	6015
Pueblo, Colorado (A)	418	411	456	4824	5655	5328	5514
Raleigh, North Carolina (C)	272	211	183	2719	2579	3234	3234
Rapid City, South Dakota (A)	801	459	594	7382	7339	6744	7118
Reading, Pennsylvania (C)	487	371	417	4688	4325	5293	5389
Red Bluff, California (A)	137	55	(a)	2740	2972	(a)	(a)
Reno, Nevada (A)	503	403	534	5452	6304	5436	5892
Richmond, Virginia (C)	310	265	246	3247	3093	3695	3695
Rochester, New York (A)	716	570	618	6346	5783	6472	6732
Roseburg, Oregon (C)	(a)	309	411	(a)	4319	4047	4428
Roswell, New Mexico (A)	173	238	180	3103	3853	3484	3484
Sacramento, California (C)	127	97	207	2508	2907	2600	2653
St. Joseph, Missouri (A)	490	344	342	5310	5439	5145	5161
St. Louis, Missouri (C)	423	321	276	4217	4287	4585	4585
Salt Lake City, Utah (A)	488	349	453	5497	6482	5319	5555
San Antonio, Texas (A)	48	96	0	1152	1626	1202	1202
San Diego, California (A)	127	117	174	1441	1826	1524	1645
Sandusky, Ohio (C)	626	523	726	5316	5118	6025	6208
San Francisco, California (C)	267	280	294	2474	2786	2417	3264**
Sault Ste. Marie, Michigan (A)	1054	748	819	8676	7741	8448	9285**
Savannah, Georgia (A)	138	53	0	1333	1097	1490	1490
Scranton, Pennsylvania (C)	598	471	513	5606	5187	5958	6129
Seattle, Washington (C)	452	396	462	4464	4598	4379	4934**
Sheridan, Wyoming (A)	716	451	648	7491	7582	7485	8008
Shreveport, Louisana (A)	128	110	0	1807	2029	1938	1938
Sioux City, Iowa (A)	662	450	489	7045	7121	6734	6898
Spokane, Washington (A)	629	474	504	6912	7180	5989	6355
Springfield, Illinois (C)	505	373	366	4951	4876	5317	5373
Springfield, Missouri (A)	393	325	267	4372	4453	4416	4428
Syracuse, New York (A)	668	547	630	6325	5753	6614	6893
Tacoma, Washington (C)	509	417	465	4751	4895	4551	5181**
Terre Haute, Indiana (A)	551	403	333	5024	4843	4872	4872
Toledo, Ohio (A)	675	536	525	5920	5534	5897	6077
Topeka, Kansas (C)	427	314	300	4818	4992	4935	4969
Trenton, New Jersey (C)	502	365	402	4657	4237	4852	4933
Utica, New York (O)	697	494	588	6589	5459	6543	6796
Valentine, Nebraska (C)	788	478	561	7197	7217	6766	7039
Walla Walla, Washington (C)	430	254	363	5214	5372	4637	4808
Washington, D. C. (C)	377	297	348	3730	3569	4601	4626
Wichita, Kansas (A)	392	293	252	4435	4838	4673	4673
Williston, North Dakota (C)	891	460	669	9676	8847	8907	9323
Winnemucca, Nevada (C)	572	391	539	5931	6632	5950	6427**
Yakima, Washington (A)	544	382	360	6198	6347	5413	5599

(a) Data not available.
†Nome data are for March.

*Includes August.
**Includes July and August.
***New 48-year normal covering 1898 to 1946.

[1]Figures in this column are normal totals for a complete heating season, September to June, incl.

NEWS OF THE MONTH

COURSE IN SOLAR HEATING

to be given at M.I.T., August 21-26. Report will describe operation of the M.I.T. solar house.

The first complete report on operation of the M.I.T. solar heated house will be presented to members of a course-symposium on Space Heating with Solar Energy at the Massachusetts Institute of Technology from August 21 to 26. The full report, according to members of the M.I.T. solar energy conversion committee, will provide a basis for their prediction that "a 10%-auxiliary-fuel-burning house is possible without ultra-high construction cost" in the Boston area.

• **SYMPOSIUM.** — These figures, which are based on only three months of the mild 1948-49 heating season, will be amplified to include results from the entire 1949-50 season at this course by Professor A. G. H. Dietz, department of building engineering and construction; Professor A. L. Hesselschwerdt, Jr., department of mechanical engineering; and Professor H. C. Hottel, department of chemical engineering.

Symposium leaders at the summer event will include: E. R. Ambrose, American Gas and Electric Service Corporation; Eugene Ayres, Gulf Research and Development Company; Professor F. W. Hutchinson, department of mechanical engineering, University of California; George Fred Keck, architect, Chicago; Dr. George Lof, Director of the Industrial Research Institute, University of Denver; George V. Parmelee, A.S.H.V.E. Research Laboratories; Dr. Paul A. Siple, Military Geographer for U. S. Army General Staff; and Dr. Maria Telkes, research associate in metallurgy at M.I.T.

Morning classroom sessions will be devoted to fundamental background material embracing the following subjects: Solar energy utilization, solar incidence, transparent and absorbent materials, solar collector heat losses, solar window design and control, heat transport—collector to use, over-all performance of solar collectors, storage and economic factors, engineering application and controls, and architectural problems.

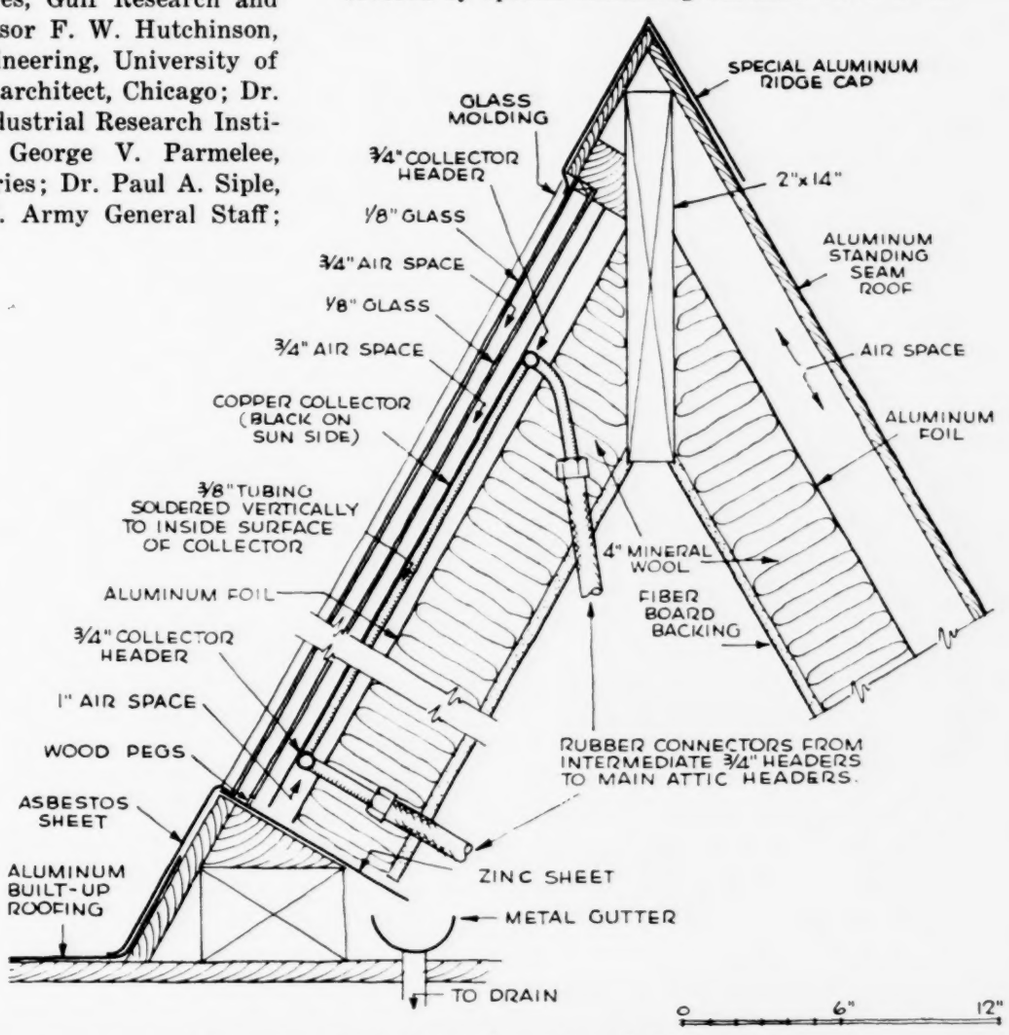
• **DEMONSTRATION.**—The M.I.T. solar heated house, opened early in 1949, and occupied by a student family while research was carried forward, will be used for demonstration purposes.

The entire solar energy research program at M.I.T., including the summer course-symposium, is made possible by the Dr. Godfrey L. Cabot Fund, originally established by a research grant in 1937.

Applications and requests for further information on this course should be addressed to Professor Walter H. Gale, Director of the M.I.T. Summer Session, Room 3-107, M.I.T., Cambridge 39. Preference will be given to those who can best benefit and put to good use the material presented.

Tentative figures released by the committee show that during the last three months of the 1948-49 heating season, the flat-plate collector on the M.I.T. solar heated house absorbed 12,350,000 Btu of solar energy heat, slightly over 30% of the total incident energy. The maximum collected in one hour during this three-month period was 82,000 Btu, 63% of the total energy then striking the unit.

Slightly more than 50% of the total heat requirement of the house was met by the solar energy roof collector during this three-month period. An additional 30% came from large double and triple glass windows in the south wall of the house, which were covered by special insulating curtains after dark.



Cross-section of solar heat collector in roof of M.I.T. house.

Though their report shows that 30% of the house heat requirement was fulfilled by the south windows of the M.I.T. house, members of the M.I.T. committee hasten to add that this is a heat source of limited practicality. Large windows are often inefficient because they cause overheating during sunny periods and excessive heat losses during sunless periods.

• **AUXILIARY.**—A house of this design, according to the preliminary calculations of the committee, could probably be heated efficiently with solar energy in a climate with an average winter temperature about 10F warmer than Boston's 40F. But such a house would still need some auxiliary equipment to carry over long periods of cloudiness and occasional extreme cold snaps.

INDUSTRIAL HEALTH

gets annual scrutiny at five-ply Chicago conference.

More than 1,800 delegates convened at the Hotel Sherman, Chicago, April 22 to 29 at the annual meetings of five national organizations concerned with the health of industrial workers. Problems in industrial medicine, handling of chemicals and radioactive elements, ventilation, nursing procedures, and atmospheric pollution received attention from a panel of speakers from a wide variety of governmental and industrial organizations. Products of interest to industrial hygiene and medicine were on exhibit in the hotel mezzanine.

• **WHO.**—The five organizations convening in concurrent sessions were the American Association of Industrial Physicians and Surgeons, American Conference of Governmental Industrial Hygienists, American Industrial Hygiene Association, The American Society of Industrial Nurses, Inc., and the American Association of Industrial Dentists.

• **ACGIH.**—The conference opened April 22 with meetings of standing committees of the American Conference of Governmental Industrial Hygienists. Round-table discussions were held on Sunday, April 23, in four groups discussing problems of chemists, engineers, nurses and physicians. Technical papers presented by members of ACGIH covered small plant health services, measurement of toxic atmospheric conditions, organized labor and industrial health, and exposures in metallic industries.

Chem. & Eng. News Photo.

Officers of AIHA are, l to r, E. C. Barnes, president 1949-50; A. D. Brandt, president 1950-51; A. M. Baetjer, president-elect.

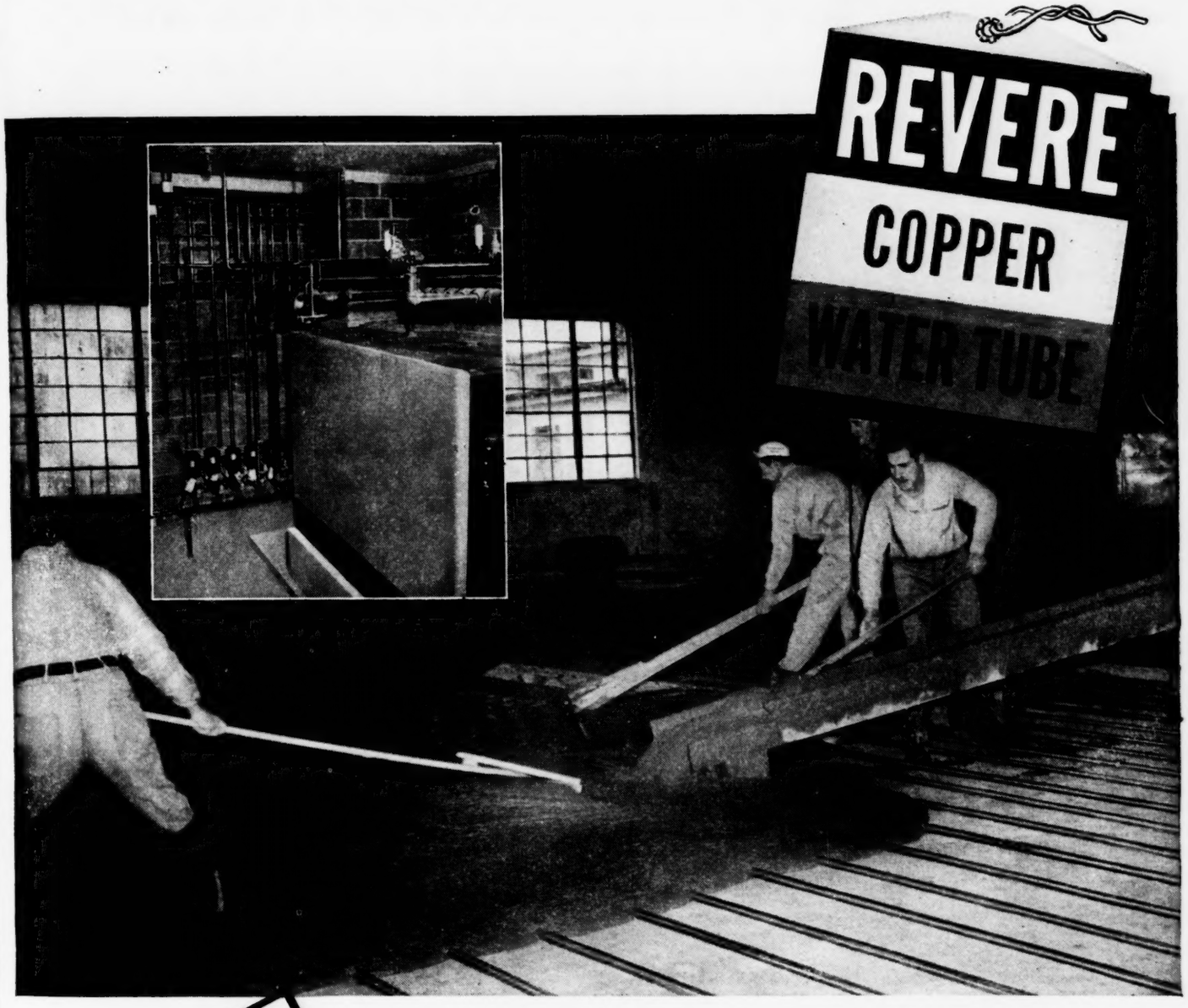
• **AIHA.**—The American Industrial Hygiene Association was welcomed to its first session on Tuesday morning by President E. C. Barnes. Technical papers at this session covered various aspects of pharmacology and toxicology and included a discussion of the evaluation of antihistaminic activity in new products by Bradford N. Carver, Ciba Pharmaceutical Products.

Afternoon sessions included papers on chemicals active in producing cancer, by J. R. Heller, Jr., director, National Cancer Institute, and the toxic effect of various other chemicals. A comprehensive discussion of industrial hygiene codes was presented by James H. Sterner, M.D., assistant medical director, Eastman Kodak Co.

Round-table conferences on toxicology, engineering,

Demonstrating air sampling equipment for television audience during AIHA convention are, l to r, William Evans, m.c. of the Bill Evans show, station WBKB, Chicago; W. F. Sholtz, Allis-Chalmers Mfg. Co.; J. B. Gisclard, American Cyanamid Co.

Philip Drinker, left, who delivered the 1950 Cummings Memorial Lecture at the AIHA annual banquet, receives from president Barnes the AIHA Certificate of Award for outstanding contributions to the field of industrial hygiene.



Concrete is being poured over 1" Type L Revere Copper Water Tube in this radiant panel heating installation at Driscoll Chevrolet Agency, Spring Valley, New York. Boiler and zone circulators are shown in inset.

Architect: Joseph M. Pilati, Pearl River; General Contractor: Harvey B. Keesler, Spring Valley; Heating and Plumbing Contractor: Irving Keesler, Spring Valley; Consulting Engineer: Roger M. Wells, Bayside, Long Island.

OK

...for RADIANT HEATING

REVERE Copper Water Tube is used to advantage in either floor or ceiling installations of radiant panel heating. Its strength and resistance to corrosion assure long service. Joints made with solder fittings keep installation costs surprisingly low.

Hard temper Revere Copper Water Tube comes in straight lengths of 12 or 20 feet. Easy-to-bend soft temper tube is available in similar lengths or in long coils.

Revere Copper Water Tube is also suitable for industrial uses. Type B Copper Tube is available for installations requiring outside diameters of SPS pipe and brazed fittings; Red-Brass Pipe and Copper Pipe for use with threaded fittings.

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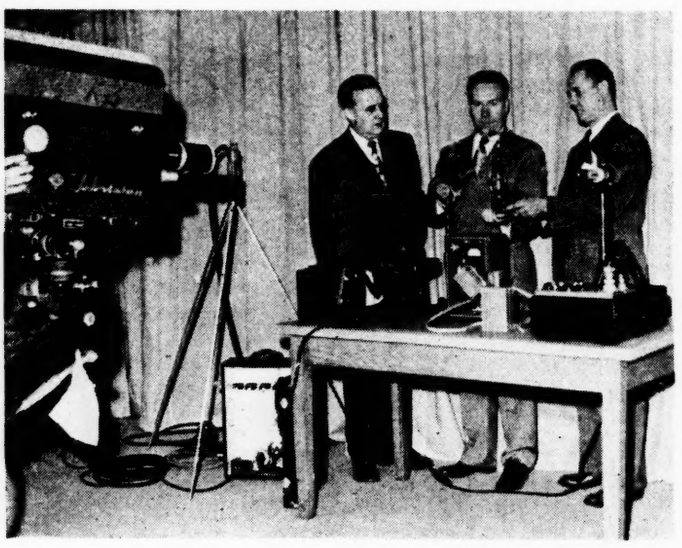

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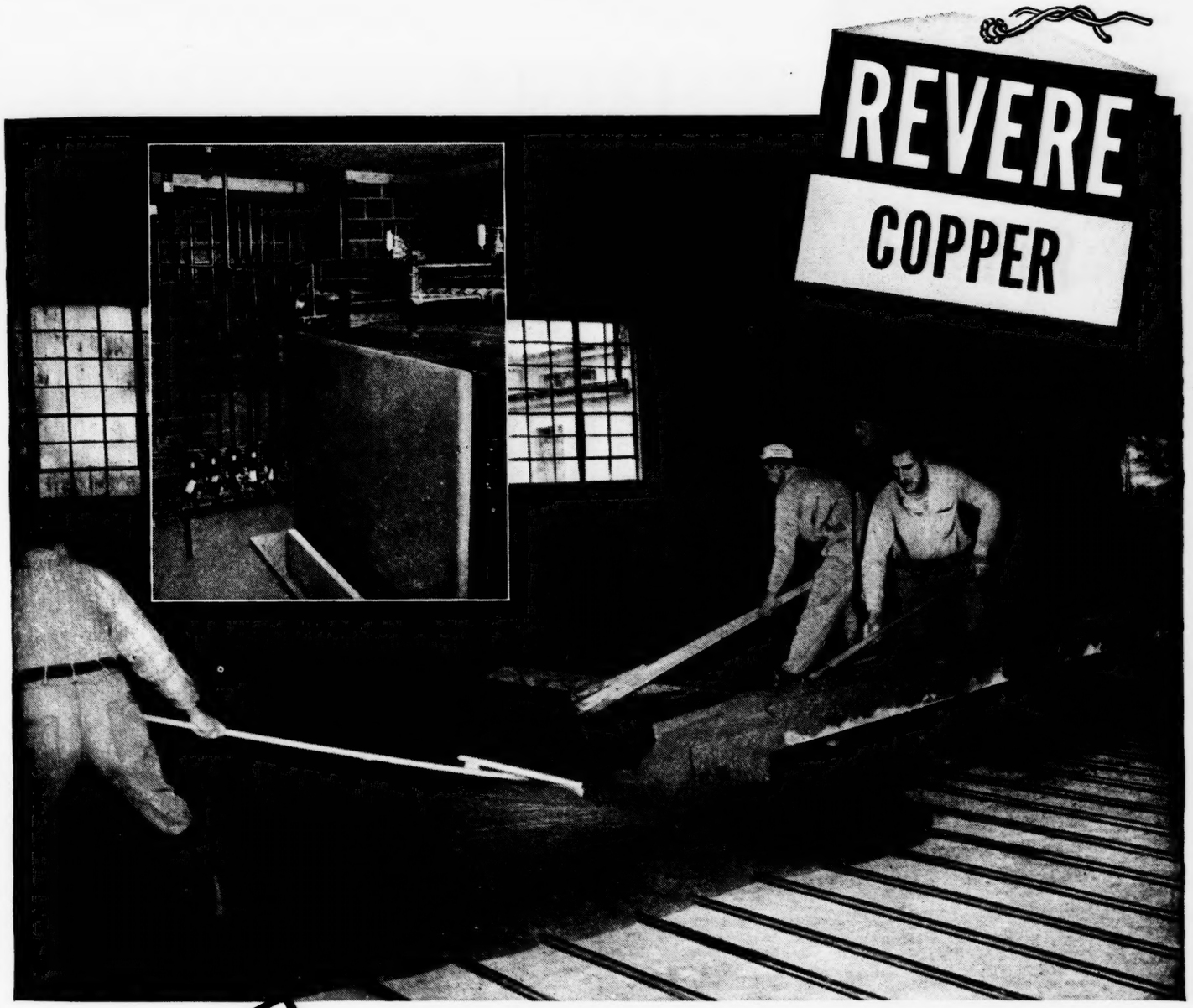

OK

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Architect: Joseph M. Pilati, Pearl River; General Contractor: Harvey B. Keesler, Spring Valley; Heating and Plumbing Contractor: Irving Keesler, Spring Valley; Consulting Engineer: Roger M. Wells, Bayside, Long Island.

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chemistry, and radiation were scheduled for Tuesday evening.

• **CLEAN AIR.**—Atmospheric pollution control by local industrial hygiene units was the subject of a paper delivered Wednesday afternoon by Wilmer H. Shulze and Charles E. Couchman, both of the Baltimore City Health Department. High efficiency dust collection of radioactive materials was discussed by Knowlton J. Caplan, Mallinckrodt Chemical Works. A paper on the efficiency of filtration methods for the collection of toxic atmospheric impurities was prepared by Sidney Laskin, P. Frank, D. Meier, and R. Wilson, University of Rochester School of Medicine.

A review of the silicosis conference at Sidney was presented by Theodore F. Hatch, University of Pittsburgh.

Ventilation of open surface tanks was discussed by Arthur C. Stern of New York State Department of Labor. Mr. Stern said that electroplaters, dyers, tanners and others working in fumes from tanks filled with hot or hazardous liquids can look forward to an improvement in their job conditions rising out of a proposed new American Standard Safety Code for ventilation and safe operation of open surface tanks. Mr. Stern reported that many spokesmen of industry had come to substantial agreement on proposals in the code, which is under joint sponsorship of ASHVE, NAFM and AIHA.

• **HONORED.**—The Cummings Memorial Lecture was presented at the annual AIHA banquet meeting by Phillip Drinker, Harvard School of Public Health, who was presented with a certificate of award for outstanding contributions to the field of industrial hygiene.

On Thursday, the final day of the AIHA conference, engineering papers were presented on dust control in metal mines and recirculation of industrial exhaust systems.

• **RECIRCULATION.**—Recirculation of industrial process exhaust air conserves heat during cold weather, according to a paper by Arthur C. Stern and Donald P. O'Neil, both of the New York State Department of Labor. Control systems are needed for air recirculation to keep down dust, odor, and smoke. Two such systems based on outdoor temperature were proposed, and methods for calculating net annual recirculation, heat saving, and saving of required heating plant capacity were given. One system was a simple on-off control said to discharge all process exhaust outdoors whenever outdoor temperature exceeds a certain control temperature. The other system was a modulating type which controls the portions of recirculated air according to outdoor temperatures. With the modulating system, makeup air heating savings of the order of 50% of heat which would otherwise have been lost in exhaust air are possible. Plant capacity savings, in that portion of the heating plant needed for heating outdoor makeup air, of the order of 70% can be secured with net annual recirculation under 20%, according to the Stern-O'Neil paper.

• **PARATHION.**—William R. Bradley, American Cyanamid Company, presented a paper prepared jointly with D. O. Hamblin, medical director of that company, covering toxicity and safe use of parathion, a powerful and economically important insecticide. Methods have

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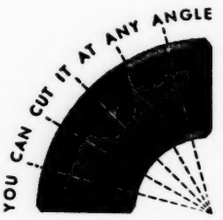

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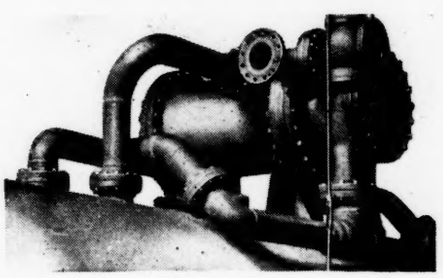

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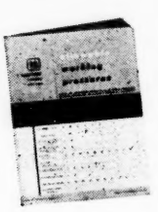

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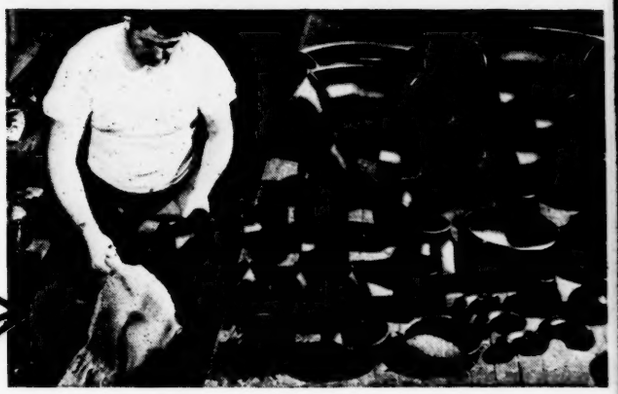

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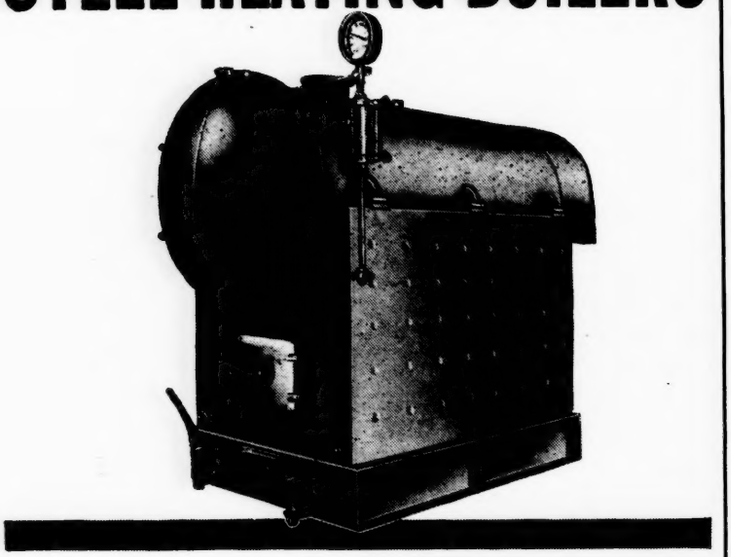

Cutaway view to show Type CC Compact Boiler (hand fired)

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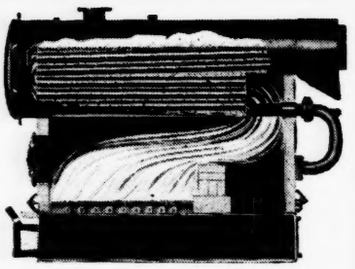
2. Large Furnace Volume
3. Large Disengaging Area
4. Large Steam Volume
5. Long Heat Travel



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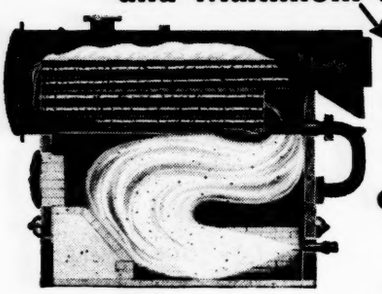

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been developed for rapid determination of parathion in concentrated dusts which can be performed in 15 minutes. Mr. Bradley described several handling techniques in the manufacture of parathion. Part of the Cyanamid program has been to visit and advise purchasers on personal protection and proper handling of the material. A report on toxicological tests of the substance will be published.

Other papers in the concluding session of AIHA covered control of health hazards in medical laboratories, ventilation of beryllium process operation, and corrosion resistant materials for exhaust systems.

• **DUCTS.** — J. W. McWilliams, Eastman Kodak Co., pointed out that corrosion resistance of duct materials is a relative quality depending on properties of the material and the nature of the exposure in its use. Installation and maintenance are major factors in the life of duct materials. The value of unprotected steel is questionable because of local job variations and conflicting data. Unpainted galvanized steel is generally successful on internal or alkaline applications but the presence of small quantities of acid fumes causes rapid failure. Painted coatings are limited by workmanship of the application since an open hole in the coating can start progressive failure. The best practice, as borne out by the data assembled, is to use a metal relatively immune to attack or else to use a thick lining over it. A table of duct life in years will be published as part of the proposed American Standard Code for safety and ventilation of open surface tank operations, Z-9.1, after approval.

• **ELECTED.** — The first woman to be chosen for the presidency of AIHA is Anna M. Baetjer, Sc.D., associate professor of physiological hygiene at Johns Hopkins School of Hygiene and Public Health. Dr. Baetjer's many publications on industrial hygiene include such matters as effect of temperature and humidity on industrial workers, industrial fatigue, and the effects of exposure to drugs on resistance to lobar pneumonia. She has recently been engaged in a study of lung cancer among chrome workers and presented a paper on the subject at the AIHA conference April 26. Dr. Baetjer was chosen president-elect to take office in 1951.

President of AIHA for 1950-1951 is Allen D. Brandt Sc.D., Bethlehem Steel Company. E. C. Barnes, who presided at this year's conference, will continue in service as past president. Newly appointed directors were Leonard Greenberg, M.D., New York State Department of Labor; Leopold Scheflan, Ph.D., Pyrene Mfg. Co.; and L. V. Taylor, American Can Co.

AIR POLLUTION

under fire at three-day Washington conference of experts.

Creation of a permanent Advisory Council to study problems of air pollution was recommended May 5 at the closing session of the United States Technical Conference on Air Pollution. The conference—first of the kind held under federal sponsorship—lasted three days and attracted nearly 700 authorities on air pollution topics.

The proposal to form the permanent Study and Ad-

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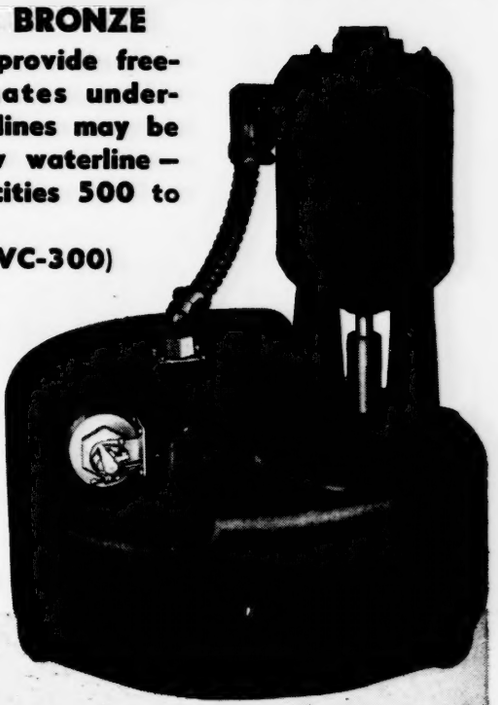

Fig. 302

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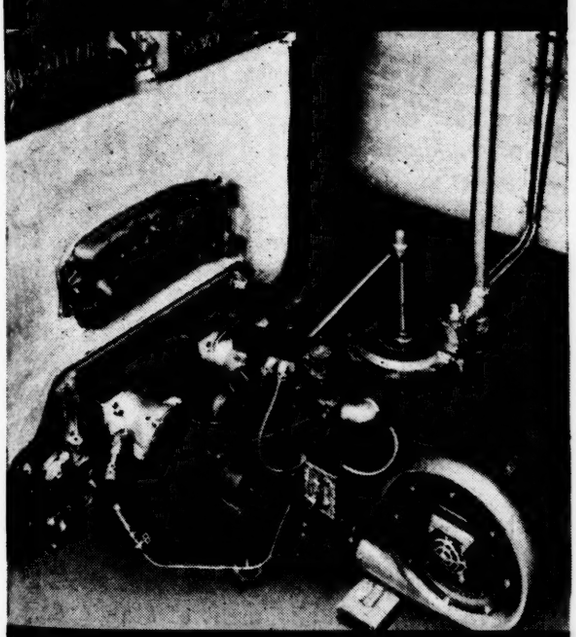

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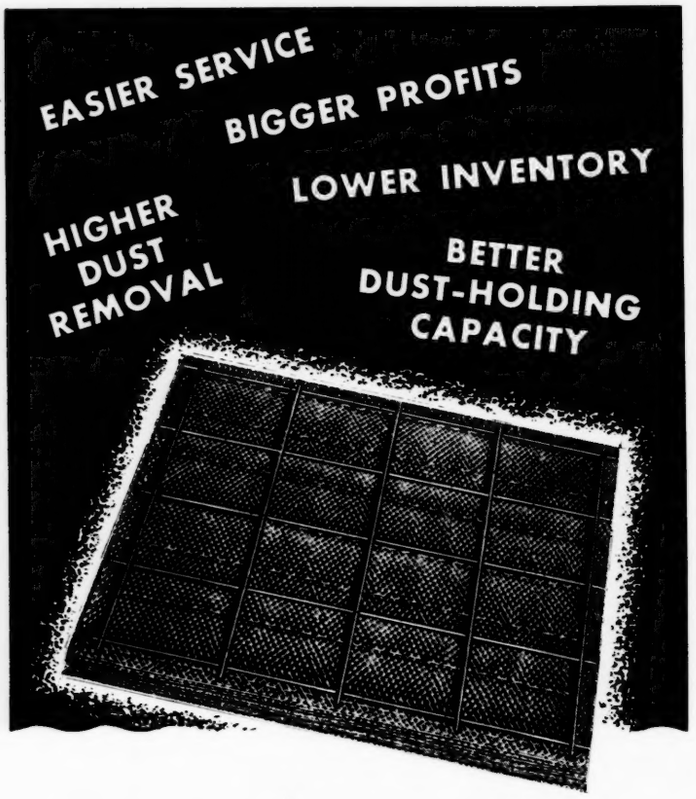

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visory Council was drafted by a steering committee headed by William P. Yant, of the Mine Safety Appliances Co. of Pittsburgh, Pa. Mr. Yant's group of 10 will serve as an interim committee until the permanent organization can be completed. It is expected that will be done in about six months—upon publication of complete proceedings of the conference.

Action of the conference in deciding upon the need for a permanent organization followed submission of reports to the closing general session by chairmen of seven panel discussion groups. These groups had discussed the subject of air pollution as affecting their particular interests—health, equipment, instrumentation, analytical methods and properties, legislation, agriculture, and meteorology.

All panels agreed that a problem costing lives, million of dollars, and untold quantities of agriculture and forest products, deserves greater attention then it has been given in the past. These conclusions are said to be what President Harry S. Truman hoped would follow when, in December, he called upon the Secretary of the Interior to organize within the government an interdepartmental committee which was in turn to sponsor the current conference.

The tip-off that some form of permanent organization would follow the conference came in the opening message of Assistant Secretary of the Interior C. Girard Davidson. Reading a message from President Truman, Mr. Girard said:

"There is an urgent need to bring to bear on the problem of air pollution all the scientific knowledge at the command of industry, government, and scientific institutions.

"With the increasing industrialization of the United States, contamination of the air around us has become a serious problem, affecting all segments of our population. Air contaminants exact a heavy toll. They destroy growing crops, damage valuable property, and blight our cities and the countryside. In exceptional circumstances, such as those in Donora, Pa., in 1948, they even shorten human life.

"It is my hope that the exchange of specialized information which takes place at the United States Technical Conference on Air Pollution will contribute toward prompt initiation of corrective measures.

"Since the problem of controlling atmospheric contaminants is primarily local in character, I believe that each locality should study its own situation and draft laws adapted to local conditions. Before this can be done, however, standards of evaluation and control of air pollutants need to be established. The federal government should take the leadership in doing this part of the over-all job, and I hope that Congress will see fit to appropriate the necessary funds for research.

"I trust that the recommendations made by this conference will aid in shaping up a comprehensive plan for the study and control of atmospheric pollution."

In reading the Presidential message, the Assistant Secretary of the Interior added another thought: "The President has said that the federal government should take the leadership in the establishment of standards. He is awaiting your proposals on how this might be done. I am confident that your proposals will point

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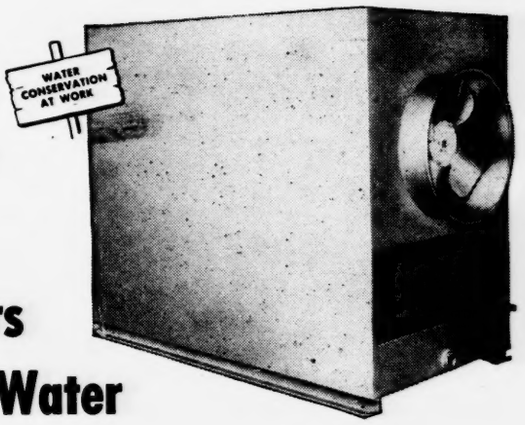

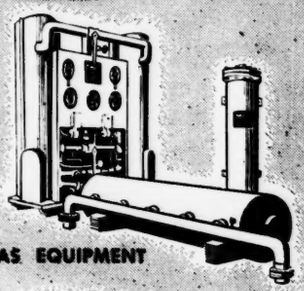

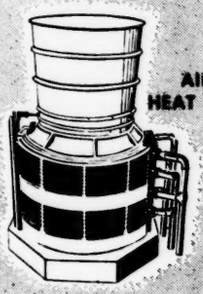

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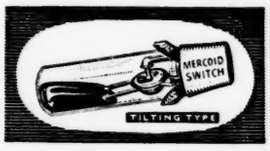

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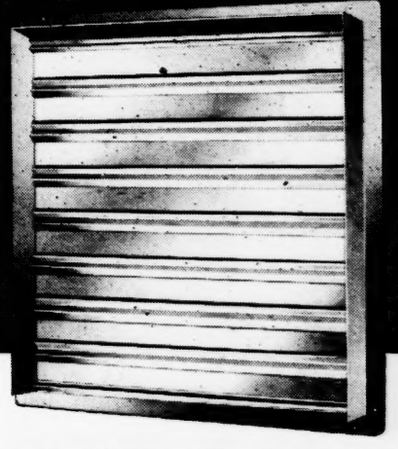

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the way for specific, concerted action by local governments, by industries, by universities and other cooperating groups.

Workshop sessions of the three-day conference were the panel sessions, where nearly 80 papers covering virtually all phases of air pollution were presented by experts from the United States, Canada, and Great Britain.

• **HEALTH.**—The health panel proved to be one of the most dramatic—leaving the impression that it would be better for all concerned, and far safer, if all air could be treated and conditioned before entering the lungs. The panel included discussions of the short-range effects of exposure to high concentrations of air pollutants; also on the effect of air pollution on cancer, skin, and acute infectious respiratory diseases, as well as the acute affects of air pollution over Donora, Pa. (The smog—fog plus smoke or other contaminants—which hung over the community for five days in 1948—resulted in the death of 20 persons and the illness of nearly 6,000.)

In another health panel discussion, Dr. Irving R. Tabershaw, Director of the Eastern Medical Division of the Liberty Mutual Insurance Co. of New York City, observed that chemically active air pollutants such as beryllium and its compounds may begin or increase disease processes. Dr. Tabershaw told of deaths which appeared to result from dust contaminants released into the atmosphere during the manufacture of fluorescent lamps.

Insecticides were named as an asthma cause in a health panel talk by Dr. Fred W. Wittich, of the American College of Allergists, Minneapolis, Minn. A possible field for industrial air conditioning was suggested by Dr. Wittich's comments that asthma is common among furriers, asphalt workers, employees working with chromium plating, bakers adding ammonium persulfate to flour, and carpenters. Fumes and particulate matter from manufacturing linseed oil, castor oil, cedar oil, malt, paint, paper and stock feeds, as well as dusts from feed, flour and seed mills, are major causes of respiratory allergies, he pointed out.

Even the teeth may decay as a result of air contamination, the health panel was told by Dr. James M. Dunning, Harvard University School of Dental Medicine, Boston, Mass. Agents that cause physical damage to the teeth, such as staining or abrasion, include copper, iron, nickel, chromium, coal dust, celluloid, sawdust, flour and tobacco, Dr. Dunning pointed out. Chemical damage, usually associated with some disease of the teeth or the soft tissues surrounding them, has resulted from various heavy metals, fluorine, phosphorus, ionizing radiation, and sugar, he said. Bismuth, lead, and mercury greatly increase peridontal disease and usually produce gingival discoloration, as well, he added.

Close contact with heavy acid fumes during five or more years has produced serious dissolving of the teeth among employees in storage battery tending, gun cotton dipping, and glass working, Dr. Dunning said. Carbohydrate dust from bakeries and fluorine from smelters also have a harmful effect.

The health panel also heard about controlling the discharge of toxic and radioactive materials from

atomic energy plants. Dr. Abel Wolamn, consultant for the Atomic Energy Commission, was the speaker.

Another startling health panel revelation was that fluorosis, a disease of the bone which some cattle in the state of Washington have developed, is believed caused by eating vegetation contaminated by fluorine. The same contamination is causing leaf scorching in prune trees and gladiolus in Washington state, and is suspected of causing damage to Ponderosa pine stands there, according to Vernon L. Miller, who is associated with the Western Washington Experiment Station, Puyallup, Wash.

Dr. Percy W. Zimmerman, associated with the Boyce Thompson Institute for Plant Research, Inc., Yonkers, N. Y., also told the health panel how sulphur dioxide and other gases from industrial operations cause serious injury to plants.

• **WEATHER.**—The meteorological panel discussed the relationship of weather to air pollution, covering such subjects as fog, diffusion of hot smokes from chimneys, and the application of meteorological control to atmospheric pollution problems.

• **EQUIPMENT.**—The panel on instruments presented papers describing new developments in detecting, collecting and determining air contaminants. Included were discussions on atmospheric sampling by electrostatic precipitation, sonic method of determining particle size, aerosol detection and measurements, and instruments used in Great Britain.

At the panel on equipment, discussions centered on equipment used to prevent air pollution, including dry fibrous filters, spray towers, scrubbers, electrical precipitation equipment, sonic collectors, and the use of short stacks and chimneys in congested and uncongested areas; incinerators to control atmospheric contamination, and of smokeless, hand-fired coal-burning equipment. Other papers covered the properties of aerosols as related to air cleaning, odor control practices, railroad activity in reducing atmospheric pollution, and abatement of smoke and dust from small industrial heating plants.

• **METHODS.**—Papers presented at the panel on analytical methods and properties, covered the chemical analysis of air pollutants, spectrometric analysis and its application to atmospheric pollutants, measurements of concentrations and characteristics of atmospheric contaminants, and application of the infrared spectrometer and the electron microscope to air pollution.

Presenting the many legal problems facing municipal, county, state and federal governments in the control of air pollution, the panel on legislation considered the national aspects of legislation; the St. Louis, Pittsburgh, California and New York State air pollution regulations.

At the panel on agriculture, some of the problems mentioned at the Health Panel came in for further discussion. Papers presented discussed the effects of fluoride fumes on livestock and plants, and of sulfur dioxide on conifers; similarities between disease symptoms and chemically induced injury to plants, and the atmospheric pollution problem of mine refuse piles.

A copy of the program, listing the papers and author participants, may be obtained from the Bureau of

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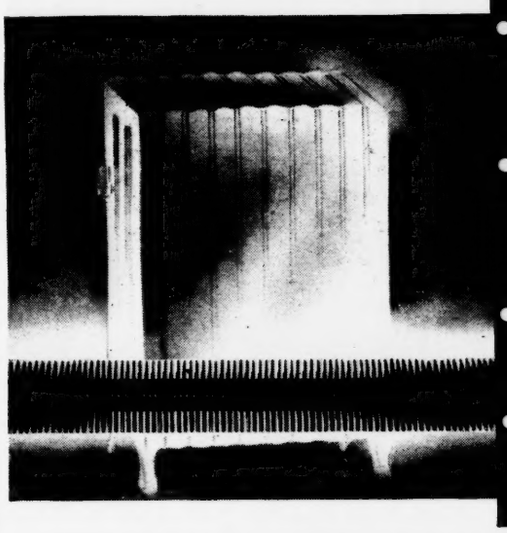

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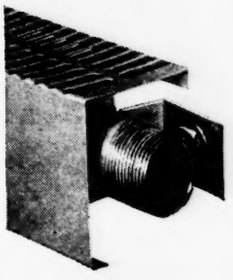
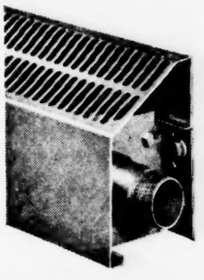
A complete new line of ornamental covers is now furnished for Kritzer Coil Sections. These covers make heating units more attractive, eliminate buying extra radiator covers. Just select the cover style that is best suited for the type of mounting and installation you have in mind.



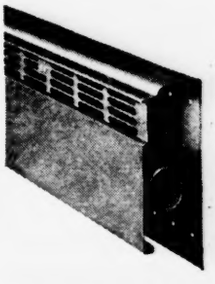
UTILITY ENCLOSURE

For factories, garages, and other locations where a simple, sturdy protective cover is needed for Kritzer Commercial Fin-Pipe Coils.



WALL-MOUNTING ENCLOSURE

For schools, offices and other installations where wall-mounting is desired, and where a more decorative cover is indicated.



UNIVERSAL BASE-BOARD ENCLOSURE

Available in Standard and Recessed Models, for hospitals, hotels, apartments and other locations where space-saving is important.

Kritzer also manufactures Radiant "Fin-Tube" Coils, and complete line of Radiant Baseboard Coils for residential use.

KRITZER RADIANT COILS, INC.

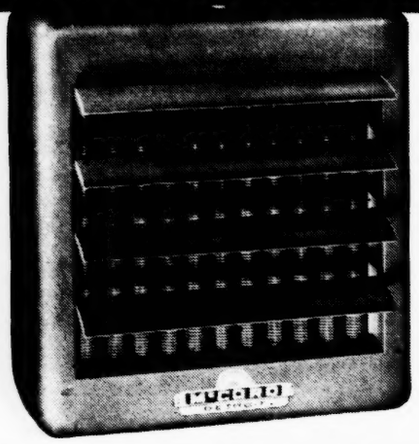
2907 LAWRENCE AVENUE, CHICAGO 25, ILLINOIS

"IF IT'S KRITZER, IT'S RIGHT, SIR!"

McCORD

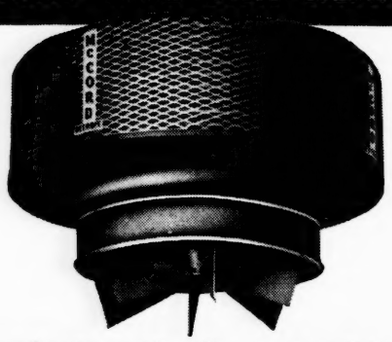
HEATING AND AIR CONDITIONING PRODUCTS

HORIZONTAL TYPE UNIT HEATERS



Modern design—top performance—thousands in use—dependable heat. All copper coils to resist corrosion — individual tube expansion — most rugged construction — quiet operation — easy installation—standard motors with standard bases. Sizes to 272,000 B.T.U. capacity.

VERTICAL TYPE UNIT HEATERS



A proven heating unit—all copper coils to resist corrosion. McCord spiral tube fin construction creates air turbulence without undue restriction. Improved fan delivers large volume of air, with minimum air noise. All McCord heaters are guaranteed for use with 150 lbs. saturated steam pressure. Sizes to 575,000 B.T.U. capacity.

McCORD CORPORATION
DETROIT 11, MICH.

Mines, Department of the Interior, Washington 25, D.C.

• **WHO.** — Agencies represented by the Interdepartmental Government Committee sponsoring the conference are: Bureau of Mines, U. S. Department of the Interior; U. S. Public Health Service, Federal Security Agency; U. S. Weather Bureau and the National Bureau of Standards, Department of Commerce; Army Chemical Corps, Office of the Surgeon General, U. S. Army, Office of the Surgeon General, U. S. A. F., Air Weather Service of the Department of the Air Force, Bureau of Medicine and Surgery, U. S. Navy, Office of Naval Research, Industrial Health Section, Department of the Navy, Research and Development Board of the Office of the Secretary of Defense—Defense Department; Atomic Energy Commission, and the Bureau of Plant Industry and the Agricultural Research Administration, U. S. Department of Agriculture.

THREE TECHNICAL SESSIONS

to be offered at semi-annual meeting of ASHVE at Muskoka, Canada, June 19-21.

Three technical sessions, one each day, will be held during the 1950 Semi-Annual Meeting of the American Society of Heating and Ventilating Engineers, June 19-21, at the Royal Muskoka Hotel, Lake Rosseau, Ontario, Canada. Eleven papers will be presented on such subjects as air conditioning, steam heating, the heat pump, heat flow through glass, the heated-thermocouple anemometer, a new psychrometric chart, forced air distribution, performance data on grilles, nozzles and perforated plates and friction losses in sheet metal elbows.

• **RECREATION.**—Technical papers will be read in the mornings leaving afternoons free to allow members to engage in the wide range of outdoor activities that have been planned by the Committee on Arrangements headed by John H. Fox, president of the Ontario Chapter ASHVE. The Royal Muskoka is built on a peninsula which juts into Lake Rosseau, one of the thousands of blue water lakes in this region. Toronto, 140 miles away, is the nearest large city.

Homespun recreation will be the keynote of the social program. Ballroom and square dancing, boat trips for large and small groups, swimming, tennis, golf, riding, sailing, campfires and picnics are included in the activities that have been planned. The Royal Muskoka is easily reached by train, plane or auto. No passports are needed at any port of entry into Canada.

The technical program:

Monday, June 19—9:30 a.m.

Transient Heat Flow Apparatus for the Determination of Thermal Conductivity, by F. C. Hooper, lecturer in mechanical engineering, University of Toronto, and F. R. Lepper, resident student in mechanical engineering, University of Toronto.

Balancing a Steam Heating System by the Use of Orifices, by D. E. Schroeder, construction inspector, Iowa State College.

(Concluded on page 133)

ABSTRACTS AND REVIEWS

Publications abstracted in this department should be ordered direct from publisher.

CHEMICAL ENGINEERS' HANDBOOK

Dr. John H. Perry, as editor, and a group of 141 specialists who contributed articles, have made possible the third edition of this handbook, first published in 1934, and widely used in the engineering and chemical fields.

A new page size of more than twice the page area of the old edition is used in order to reduce the number of pages necessary in the second edition, and to enable larger illustrations to be used, resulting in greater legibility.

A number of new sections have been added and many of the sections have been rewritten and expanded.

Articles are grouped into 30 sections as follows: Mathematical tables and weights and measures; mathematics; physical and chemical data; physical and chemical principles; flow of fluids; heat transmission; evaporation; general theory of diffusional operations; distillation and sublimation; gas absorption; solvent extraction and dialysis; humidification, dehumidification, and cooling towers and spray ponds; drying; adsorption; mechanical separation; size reduction and size enlargement; mixing of material; high pressure technique; process control; movement and storage of materials; materials of construction; fuels; furnace and kilns; power generation and mechanical power transmission; refrigeration; plant location; electricity and electrical engineering; electrochemistry; accounting and cost finding; safety and fire protection.

Chemical Engineers' Handbook, edited by John H. Perry. Flexible binding, 7 x 10 inches, 1942 pages. Published by McGraw-Hill Book Co., 330 W. 42nd St., New York 18, N. Y. Price, $15.

WARM AIR HEATING

Intended as a book to teach those in the warm air industry how to design, install, adjust and service warm air heating and winter air conditioning, Warm Air Heating and Winter Air Conditioning, by John W. Norris, president, Lenox Furnace Co., first published in 1948, is now in its second edition.

An attempt was made to phrase the text in simple, nontechnical language so that even the student who has not had extensive education will know how to calculate heat loss and design warm air heating systems. He will also be in a better position to install, adjust and service such systems. All types of heating layouts are covered as illustrative material.

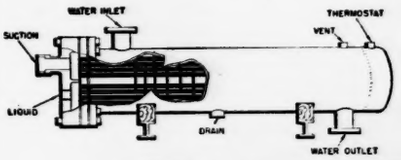
The material in this book is presented as 20 chapters which cover, in part, the following subjects:

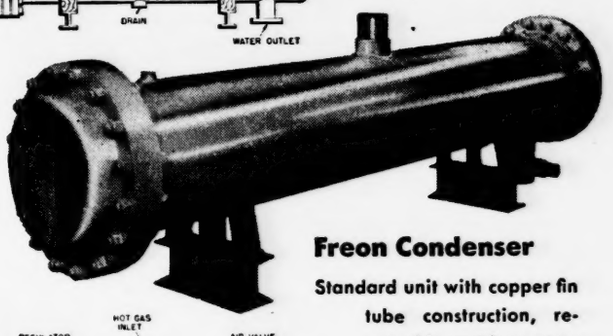
Types of heating systems; house construction; measuring heat losses from buildings; selection of equipment; designing a gravity warm air heating system; winter air conditioning of residences; adjusting, balancing and servicing winter air conditioning systems; humidity and the properties of air; air cleaning;

(Continued on page 128)

PATTERSON

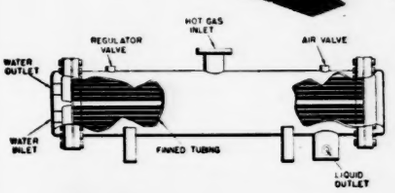
...refrigeration components you can rely on

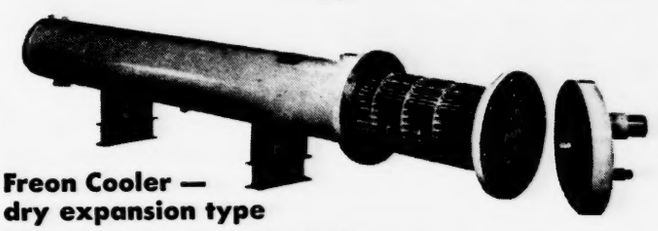




Freon Condenser

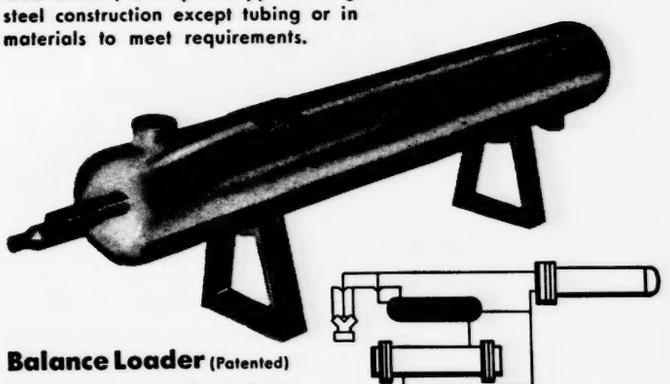
Standard unit with copper fin tube construction, removable cast iron water chambers. Freon openings to receive o.d. copper tubing. Sized up to 400 tons capacity.





Freon Cooler — dry expansion type

Billet type carbon steel freon chamber with adapters for o.d. copper tubing; removable tube bundle; U-shaped copper tubing; carbon steel construction except tubing or in materials to meet requirements.



Balance Loader (Patented)

Designed to control automatically refrigeration capacity in accordance with load demands.

Here you have three very useful auxiliary units for that refrigeration system you are laying out or installing. Our engineers will be glad to recommend proper types and sizes for your requirements.

Literature on all Patterson Equipment available.

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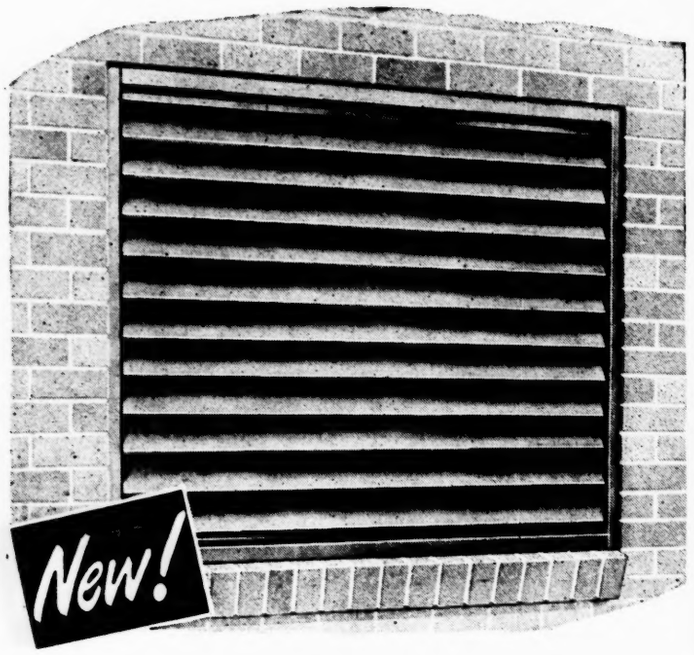
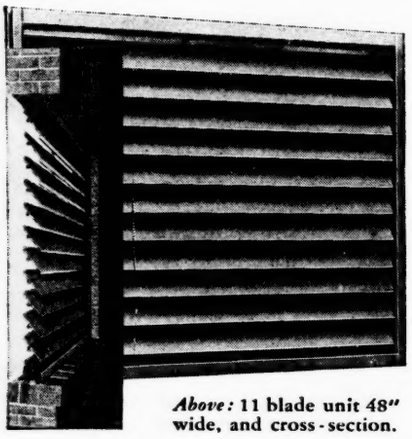


The Airlouver

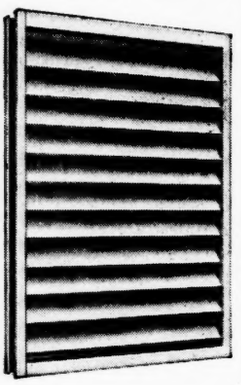
Unique louver system gives you unusual unit sizes to fill any wall opening... *no premium cost*

Invest no more money than for "standard" sizes, but have sturdy new Airlouvers to fit with custom-made accuracy. No matter what size wall opening, you can fill it with equal-size louver units that make a business-like, efficient job. Overlapping blades assure weather-tightness, open or closed. Heavy duty formed channel frame. Several handy optional operating methods and various mounting styles. Made of steel, copper, monel, aluminum or A. P. M. Also made in Fixed style. Write today for Bulletin 339F.



Above: 11 blade unit 48" wide, and cross-section.

Below: Airlouver unit 30" wide.



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The Swartwout Co.

Industrial Ventilation Specialists Since 1904

Equipment for *Controlled* Air Circulation

(Continued from page 127)

thermostatic control of warm air heating; converting gravity furnaces to winter air conditioning; converting coal furnaces to automatic fuel; industrial and commercial warm air installations; chimneys and flues.

Warm Air Heating and Winter Air Conditioning, by J. W. Norris. Cloth bound 8 x 11 inches, 320 pages. Published by McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York 18, N. Y. Price, $6.50.

ASHVE GUIDE

The technical pages of the 1950 edition of the Guide are so arranged that the 50 chapters are grouped in the following sections: Fundamentals, human reactions, heating and cooling loads, combustion and consumption of fuels, systems and equipment, special systems, instruments and codes.

A number of the chapters have been enlarged or revised by more than 35 members of the American Society of Heating and Ventilating Engineers who are also authorities in their respective fields.

Many new codes and standards of interest to the heating, ventilating and air conditioning engineer have been added.

This volume was prepared under the direction of the following Guide committee: Chairman, W. N. Witheridge, Detroit; A. B. Algren, Minneapolis; R. P. Cook, Rochester, N. Y.; Nathaniel Glickman, Chicago; P. B. Gordon, New York; E. F. Hyde, Detroit; H. R. Limbacher, Kalamazoo, Mich.; P. J. Marschall, Chicago; Clifford Strock, New York; Cyril Tasker, Cleveland; Carl H. Flink, New York.

Heating Ventilating Air Conditioning Guide, 1950. Cloth bound 6 x 9 inches, 1422 pages. Published by the American Society of Heating and Ventilating Engineers, 51 Madison Ave., New York 10, N. Y. Price, $7.50.

• • •

EARTH HEAT PUMP RESEARCH—Bulletin is the first progress report on the research at the University of Kentucky on an earth heat pump system. Installation consists chiefly of a Marvair package heat pump unit, an instrument panel and a ground coil buried in the earth. Bulletin presents some of the test information. Work was carried on by Estel B. Penrod, Head of the Department of Mechanical Engineering; Oliver W. Gard and Charles D. Jones, instructors in mechanical engineering; and Herman E. Collier and Robert N. Patey, graduate students of mechanical engineering, all at the University of Kentucky. Bulletin No. 14 is published by the Engineering Experiment Station, University of Kentucky, Lexington, Ky.

REPORT OF FUEL-BURNING INSTALLATIONS — The third edition of S.M.A. Statistical Report on Fuel-Burning Equipment Installations in Various Cities for 1949 is now available. It lists the number and type of equipment that was installed during 1949 in a large number of cities. The current study is more complete than the two reports issued for 1947 and 1948. Stoker Manufacturers Association, 307 N. Michigan Ave., Chicago 1, Ill. Price, 50 cents.

INDUSTRIAL DEGREE-DAYS
April, 1950

City	55F Base	45F Base
Baltimore, Md.	163	41
Buffalo, N. Y.	444	182
Chicago, Ill.	376	130
Cleveland, Ohio	361	137
Detroit, Mich.	407	160
Indianapolis, Ind.	304	101
New York, N. Y.	223	46
Philadelphia, Pa.	204	42
Pittsburgh, Pa.	260	99
St. Louis, Mo.	169	38

Canadian Degree-Days for April, 1950*

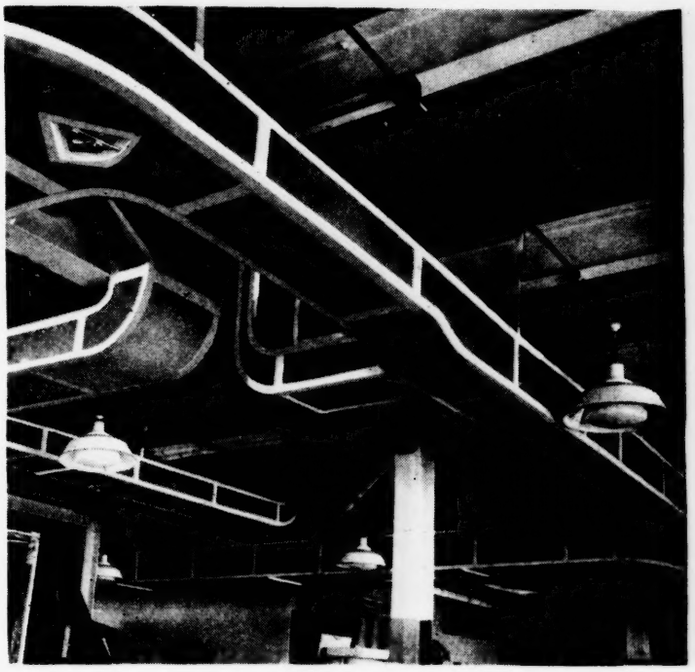
City	April		Cumulative Sept. 1 to Apr. 30	
	1950	Normal	1949-50	Normal
Calgary, Alta.	886	750	9702	8631
Charlottetown, P. E. I.	852	858	7710	7727
Crescent Valley, B. C.	702	624	7735	7328
Edmonton, Alta.	874	780	10441	9369
Fort William, Ont.	1107	888	10133	9478
Grande Prairie, Alta.	1014	822	11059	9617
Halifax, N. S.	808	768	6554	6903
London, Ont.	834	642	7049	6968
Medicine Hat, Alta.	714	606	9171	8194
Moncton, N. B.	822	798	7846	8094
Montreal, P. Q.	768	715	7856	8088
North Bay, Ont.	1032	813	9132	8746
Ottawa, Ont.	828	726	8245	8364
Penticton, B. C.	588	507	6971	6073
Porquis Junction, Ont.	1182	972	10753	10586
Prince George, B. C.	861	738	9627	8506
Quebec City, P. Q.	795	849	8280	8848
Regina, Sask.	1029	816	11166	10457
St. John, N. B.	786	792	7232	7576
Saskatoon, Sask.	978	725	11328	10081
Toronto, Ont.	766	669	6471	6895
Vancouver, B. C.	557	498	5572	4977
Victoria, B. C.	531	504	5086	4569
Windsor, Ont.	732	582	6229	6454
Winnipeg, Man.	1064	822	11021	10444

*These data are supplied through the courtesy of the Meteorological Division, Air Service Branch, Department of Transport, Canada.
The Department reports a slight revision in the figure for March for Montreal, as published in last month's issue. Corrected figure is 1363.

Getting Personal

C. M. toeLaer (co-author, *Air Conditioning Retail Stores with Self-Contained Units*, page 75) was graduated from the Armour Institute of Technology in 1940 with a B.S. in Electrical Engineering, and also attended the University of Chicago.

He has been with General Electric since 1940. Following his graduation from the test course, he was assigned to application engineering work in the apparatus department, and subsequently was appointed to his present position of application engineer in the air conditioning department, Bloomfield, N. J. He is responsible for application and



...this job delivers real SUMMER COMFORT!

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DUX-SULATION

(ASBESTOS-PROTECTED)

. . . insures maximum temperature control—lower operating costs — better system balance —minimum sound travel—no condensation—smoother air flow — greater unit capacity —lower fan speeds.

Architects, Engineers, Contractors, Maintenance Men . . .

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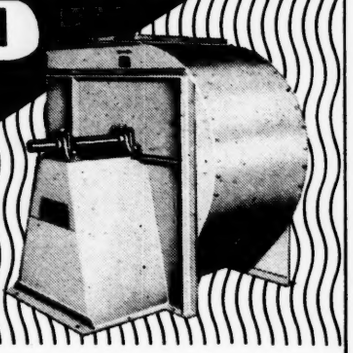
ASBESTOS and INSULATING MATERIALS

MASSACHUSETTS
Squirrel Cage and Power Fixed
FANS



SQUIRREL CAGE FANS

Fan wheels have low speed characteristics. The low air velocities permitted are conducive to efficient operation. Housings are rugged and compact. Wheel sizes Single Width 13½" to 86½" dia. Double width 18" to 86½" dia.

POWER FIXED FANS

Backward curve blade type with non-overloading characteristics. Housings are constructed of steel plate and reinforced with heavy bracing angles. Wheel sizes Single Width 13½" to 86½" dia. Double Width 18" to 86½" dia. Class I or Class II construction for better fan selection.

Write for catalogs.

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The BISHOP & BABCOCK Mfg. Co.
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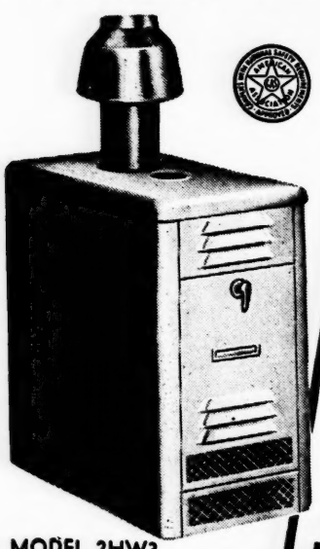
GAS HEATING EXPERTS SELECT . . .
HYDROTHERM
FOR RADIANT & CONVECTOR SYSTEMS.



MODEL 2HW3
Capacity: 72,000 BTU Input
Size: 13"x26"x26"
Weight: 250 lbs.

Exclusive Cast-Iron Design Assures Maximum Performance at Lowest Cost in Minimum Space

AGA Approved for All Gases
100 lbs. A.S.M.E. Rating

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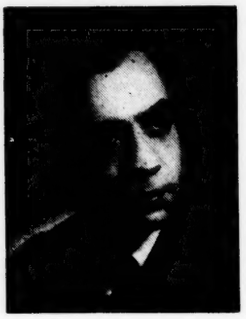
consulting engineering on cooling and heating equipment, including new application developments.

Mr. toeLaer is the author of many articles on air conditioning and heating which have appeared in the trade and technical press.



C. M. toeLaer

J. C. Woodson

J. C. Woodson (co-author, *Air Conditioning Retail Stores with Self-Contained Units*, page 75) is currently engaged in product planning activities on year-round residential air conditioners in General Electric's air conditioning department, Bloomfield, N. J.

Prior to joining General Electric in 1948 he was chief engineer of Webster Tallmadge & Co., East Orange, N. J., and before that held the position of assistant to the director of the field engineering department, Hazeltine Corp., Little Neck, N. Y.

A native of Pennsylvania, Mr. Woodson was graduated from Purdue University in 1940 with a B.S. in Electrical Engineering.

H. W. Terry

Harry W. Terry (*Architect-Engineer Relations Can Improve Engineering Design*, page 90) studied engineering at Syracuse University. After graduating as a mechanical engineer, he did graduate work in sanitary and industrial water analysis at Minnesota University and in business administration at New York University. His practical experience began in the shops of the Allis-Chalmers Company where he took a special apprenticeship for college graduates. He was power plant draftsman for the Western Electric Company and the International Harvester Company, and subsequently designed mechanical and electrical equipment for buildings for a number of architects. He opened his own office in St. Paul and Minneapolis where he practiced his consulting engineering for a number of years. Mr. Terry entered the Army in January, 1941 and was separated from service as a Colonel. He has been practicing engineering in the New York area since that time.

. . . Since the Last Issue

Oliver J. Prentice, recently retired advertising and sales promotion manager of C. A. Dunham Co., has organized a consulting service as advertising and public relations counsellor specializing in growth potential of smaller firms. His office is at 601 Diversey Parkway, Chicago 14, Ill.

A. M. Byers Co. is again making flat and corrugated hot rolled annealed wrought iron sheet, black as well as galvanized, from 8 gage to 22 gage available.

The establishment of a new sales division in the marketing organization of **General Electric's Air Conditioning Department** has been announced. The new division will be responsible for the sale and servicing of automatic heating equipment, air conditioning equipment, refrigeration machines, commercial refrigeration, and water coolers. **H. M. Brundage,** manager of the former automatic heating division has been appointed manager of the new division. **Harry J. Wines,** formerly manager of automatic heating sales, has been named manager of distribution sales.

J. M. Floyd

J. M. Floyd, who has been vice-president in charge of manufacturing for the **A. O. Smith Corp.** has been named executive vice president of the company. Mr. Floyd in his new position will take over general operating supervision of the company under the general direction of the president. Mr. Floyd has been in charge of manufacturing since he came to A. O. Smith in 1936 from the Bendix Aviation Corp. of South Bend, Indiana. There he had been works manager of that company's Bendix Products division. In addition to his new position, Mr. Floyd is a member of the board of directors and of the executive committee of A. O. Smith, and holds the position of vice president of the A. O. Smith Corp. of Texas.

Kewanee Boiler Corp. has announced that **W. B. Russell** has been elected president of the corporation to fill the vacancy created by the death of **R. B. Dickson** on April 9, 1950. Mr. Russell was also elected a director of the corporation. Graduating from the University of Illinois with a B.S. in mechanical engineering, Mr. Russell took a position with Heggie-Simplex Boiler Co., Joliet, Illinois. Prior to leaving there to come to Kewanee in July, 1933, he was assistant to the president.

W. E. McWhorter has been promoted to advertising manager of **Owens-Illinois Glass Company's Kimble Glass Division** and **American Structural Products Co.,** a subsidiary. Mr. McWhorter joined Owens-Illinois in 1944 as advertising manager of the Insulux Products Division, which later became a part of American Structural Products Co. When American Structural Products Co. was reorganized in July, 1949, Mr. McWhorter continued to guide the advertising activities of Insulux glass block.

Promotion of **J. F. Knoff** to the post of assistant general sales manager, **Airtemp Division of Chrysler Corp.,** has been announced. Mr. Knoff joined Airtemp as district representative in the New Orleans region, June 1, 1945. He became regional manager there and later was transferred to Dayton as divisional manager in September, 1947. The following September he was appointed sales director, his position at the time of promotion. Mr. Knoff makes his home in Dayton, Ohio. **A. F. Ward** was appointed to the post of sales director, replacing Mr. Knoff. Mr. Ward has been with Airtemp since 1940, when he joined the division's St. Louis regional staff. In 1942 he was transferred to Dayton to handle project heating sales. He was made director of packaged cooling in 1945. Another recent appointment was that of **E. D. Dickson,** who was made manager of parts and sales. Mr. Dickson came to Airtemp in 1940 as a member of the Planning Dept.

Kritzer Radiant Coils, Inc., Chicago, announces the following representatives: **Blankin Equipment Co.,** Philadelphia, covering eastern Pennsylvania, Delaware, and southern and western New Jersey; **O'Brien Specialty Co.,** Syracuse, N. Y., covering northern New York; and **Midwest Sales Co.,** St. Louis, Mo., covering southwestern Illinois, eastern Missouri, and western Kentucky.

for • SPRAYING
• WASHING
• RINSING
• COOLING
• AIR CONDITIONING

YARWAY

SPRAY NOZZLES

FAN-TYPE FOR FLAT SLICING SPRAY

Get the most out of your Spraying Equipment with minimum power . . . with efficient spraying.

Use Yarway Nozzles. No internal vanes or other restrictions to clog or hinder flow. Two types—Yarway Involute-type producing a fine hollow spray with minimum energy loss, and Yarway Fan-type producing a flat fan-shaped spray with time-saving slicing action for cleaning.

Wide range of standard sizes and capacities. Cast or machined from solid bar stock.

Thousands in use. - - Write for Bulletin N-616.

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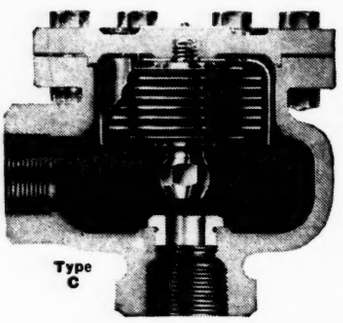
104 Mermaid Avenue Philadelphia 18, Pa.

Nicholson Steam Traps Feature

MAXIMUM AIR VENTING

for Faster Steam Transfer

Substantial evidence of the venting effectiveness of Nicholson steam traps is their wide recommendation for eliminating non-condensible gases, as well as condensate in such equipment as jacketed kettles. Other Nicholson features: operate on lowest temperature differential; 2 to 6 times average drainage capacity.



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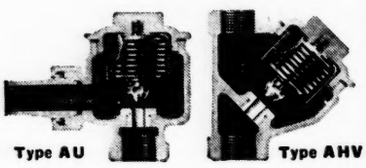
5 Types for Every Plant Application

Process, heat, power. Size ¼" to 2"; pressures to 225 lbs.



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BULLETIN 450 or see Sweet's

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This is Job No. 14—all in one year—in New York City alone—in which Therm-O-Tile Underground Steam Conduit was specified. For a more complete understanding of the use of Therm-O-Tile in New York's huge housing projects see our ad in the January 1950 issue of Heating, Piping and Air Conditioning.

Also, ask for Bulletin 381 which tells in detail why Therm-O-Tile is so consistently used in the largest central heating projects.

H. W. PORTER & CO., Inc.

823-V Frelinghuysen Ave. Newark 5, N. J.

Kewanee Boiler Corp. has announced that **E. M. Palmer** has been elected vice president of the corporation. Mr. Palmer graduated from Simpson College, Iowa, in 1924, and occupied a position with one of the banks till 1926, when he started with the Kewanee Boiler Co. in their bookkeeping department. In 1931 he was transferred to government sales department and became manager in 1942. Mr. Palmer was advanced to assistant general manager of sales in 1945 and since February 1, 1948 has had the title of vice president general manager sales.

R. Steinley

United States Air Conditioning Corp., Minneapolis, Minn., manufacturers of air conditioning and heating equipment, announced the appointment of **Reinhard Steinley** of St. Paul as advertising and sales promotion manager. Mr. Steinley's appointment is said to mark the beginning of the company's plans for a vastly extended advertising and promotion program. Before coming to the United States Air Conditioning Corporation, Mr. Steinley was associated with several Minneapolis and St. Paul advertising and graphic arts firms.

A. F. Tudury, president of **Refrigerating and Power Specialties Co.**, San Francisco, has announced that his company will handle the selling and servicing of **C. A. Dunham Co.** heating products in northern California and western Nevada.

Two important additions to the executive organization of the **American Radiator & Standard Sanitary Corp.** have been announced. **Mark A. Brown**, president of the Harris Trust and Savings Bank, Chicago, was elected to the board of directors of American-Standard to fill the vacancy caused by the death, on April 9, of Robert B. Dickson, president of the Kewanee Boiler Corp. **Clark T. Morse**, president of the American Blower Corp. and a member of the American-Standard board of directors, was appointed to the executive committee, a post which Mr. Dickson also held. Both the Kewanee Boiler Corporation and the American Blower Corporation are subsidiaries of American-Standard.

The southern portion of the sales territory served by the St. Louis electrical division branch of **Wagner Electric Corp.** was set up as a separate unit, with headquarters in Memphis and a sales office in New Orleans, on April 1, 1950. **A. C. Allen** will remain at Memphis as branch manager of the newly established territory. The remaining territory, with a main branch in St. Louis and a subbranch in Indianapolis, will be under the direction of **J. J. Scheid**, who succeeds **H. N. Felton** as manager of the St. Louis branch. Mr. Felton was recently elected vice president in charge of sales of the Wagner company.

The **Century Electric Co.** has announced that **Edwin S. Pillsbury**, one of the founders of the Century Electric Co. and president since 1914, relinquished his presidential post to be succeeded by his son, **Fred H. Pillsbury.**

Oliver Dobson has been named sales manager of **Automatic Devices Co., Inc.**, Chicago, Illinois, manufacturers of the "Weather Man" building temperature controller. Mr. Dobson was formerly connected with the U. S. Gypsum Company as assistant sales manager and served as sales manager for the Economy Electric Manufacturing Co. of Chicago and Sampsel Time Control, Inc. At the same time, Automatic Devices announced that **Edward Hartnett** has been appointed assistant sales manager, in charge of installation and servicing. Mr. Hartnett will be working out of the company's Boston office in direct charge of the New England area, while Mr. Dobson will be operating out of the New York office.

ASHVE MEETING

(Concluded from page 126)

Plant Research in the Phytotron, by Arthur J. Hess, member-owner, Hess Greiner & Polland, Los Angeles, Calif.

Thermal Conductivity of Soils for Design of Heat Pump Installations, by G. S. Smith, professor of electrical engineering, University of Washington, and Thomas Yamauchi, instructor in electrical engineering, University of Detroit.

Tuesday, June 20—9:30 a.m.

Heat Flow Through Unshaded Glass, by G. V. Parmelee, research associate, and W. W. Aubele, research engineer, ASHVE Research Laboratory.

Effective Solar Absorption of Various Colored Paints, by R. H. Heilman, senior industrial fellow, and R. W. Ortmiller, industrial fellow, both at the Mellon Institute of Industrial Research.

A Proposed Psychrometric Chart, by H. B. Nottage, research associate, ASHVE Research Laboratory.

A Simple Heated-Thermocouple Anemometer, by H. B. Nottage.

Wednesday, June 21—10:00 a.m.

Effect of Temperature on Balance of Forced Warm-Air Systems, by N. A. Buckley, special research assistant in mechanical engineering, S. Konzo, professor of mechanical engineering, J. M. David, former graduate student, and T. L. Towne, former graduate student, all at the University of Illinois.

Comparative Study of Ventilating Jets from Various Types of Outlets, by Alfred Koestel, instructor in mechanical engineering, Philip Hermann, instructor in mechanical engineering, and G. L. Tuve, professor of mechanical engineering, Case Institute of Technology, Cleveland.

Energy Losses in 90-Degree Duct Elbows, by D. W. Locklin, research engineer, ASHVE Research Laboratory.

COMING EVENTS

Where listed, names or titles of individuals are those from whom further information is available.

I-B-R SHORT COURSE—Fourth I-B-R short course on steam and hot water heating systems, sponsored by the Institute of Boiler and Radiator Manufacturers, and the University of Illinois, at the University in Champaign-Urbana, Ill. R. K. Newton, supervisor of engineering extension, Room 205, Arcade Bldg., University of Illinois. .....**JUNE 13-16, 1950.**

STOKER MEETING—Annual meeting of the Stoker Manufacturers Association, at the LaSalle Hotel, Chicago. Marc G. Bluth, executive secretary of the Association, 307 No. Michigan Ave., Chicago 1, Ill. .....**JUNE 15, 1950.**

ASHVE MEETING—1950 semi-annual meeting of the American Society of Heating and Ventilating Engineers, at the Royal Muskoka Hotel, on the Muskoka Lakes, Ontario, Canada. A. V. Hutchinson, secretary of Society, 51 Madison Ave., New York 10, N. Y. .....**JUNE 19-21, 1950.**

OIL HEAT EXPOSITION—New England's biennial exposition of oil heat, sponsored by Oil Heat Institute of New England, at Hotel Statler, Boston, Mass. Secretary of Institute, 839 Beacon St., Boston, Mass. .....**JUNE 19-22, 1950.**

ASME MEETING—Semi-annual meeting of the American Society of Mechanical Engineers, at Hotel Statler, St. Louis, Mo. C. E. Davies, secretary, 29 W. 39th St., New York 18, N. Y. .....**JUNE 19-23, 1950.**

TESTING MATERIALS MEETING—53rd annual meeting and 9th exhibit of testing apparatus and related equipment, and 7th photographic exhibit, of the American Society for Testing Materials, to be held at Chalfonte-Haddon Hall, Atlantic City, N. J. Robert J. Painter, assistant secretary of the Society, 1916 Race St., Philadelphia 3, Pa. .....**JUNE 26-30, 1950.**

(Concluded on page 134)

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(Concluded from page 133)

POWER ENGINEERS EXPOSITION — 49th annual National Power Show, sponsored by the National Association of Power Engineers, in conjunction with their 67th annual convention, at Hotel Jefferson, Chicago, Ill. Richard R. Smith Associates, 82 W. Washington St., Chicago, Ill. ....**AUGUST 15-19, 1950.**

CHEMICAL EXPOSITION—Sixth National Chemical Exposition of the American Chemical Society, at the Coliseum, Chicago, Ill. James J. Doheny, 1155 Sixteenth St., N.W., Washington 6, D. C. .....**SEPTEMBER 5-9, 1950.**

INSTRUMENT CONFERENCE—5th national instrument conference and exhibit, of The Instrument Society of America, at Memorial Auditorium, Buffalo, N. Y. Richard Rimbach, executive secretary of the Society, 921 Ridge Ave., Pittsburgh 12, Pa. ..... **SEPTEMBER 18-22, 1950.**

INTERNATIONAL ENGINEERING CONGRESS — Third International Mechanical Engineering Congress, sponsored by The British Engineers' Association, to be held in Brussels, Belgium. A. W. Berry, Director of Association, 32 Victoria St., London, S.W. 1, England. .....**SEPTEMBER 18-23, 1950.**

PETROLEUM CONFERENCE—Petroleum Mechanical Engineering Conference, at Hotel Roosevelt, New Orleans, La. Secretary, American Petroleum Institute, 50 W. 50th St., New York, N. Y. .....**SEPTEMBER 25-27, 1950.**

AGA CONVENTION AND EXPOSITION—Biennial Exposition of Gas Appliances and Equipment, in conjunction with 1950 annual convention of the American Gas Association, at Convention Hall, Atlantic City, N. J. Secretary, AGA, 420 Lexington Avenue, New York 17, N. Y., and secretary, Gas Appliance Manufacturers Association, 60 E. 42nd St., New York 17, N. Y. .....**OCTOBER 2-6, 1950.**

METALS MEETING—Annual meeting of the American Society for Metals, in Chicago, Ill. For hotel and other details, write W. H. Eisenman, national secretary, 7301 Euclid Ave., Cleveland 3, Ohio. .....**OCTOBER 23-27, 1950.**

WELDING MEETING—Annual meeting of the American Welding Society, in Chicago, Ill. For hotel and other details, write J. G. Magrath, national secretary, 33 W. 39th St., New York 18, N. Y. .....**OCTOBER 23-27, 1950.**

REFRIGERATION WEST COAST EXHIBIT—West Coast Educational Exhibit and Conference, of the Refrigeration Equipment Manufacturers Association, at Municipal Auditorium in Long Beach, Calif., to be held simultaneously with 5th annual convention of the Refrigeration & Air Conditioning Contractors Association. Edna Berggren, executive secretary, 228 No. La Salle St., Chicago 1, Ill. .....**NOVEMBER 17-19, 1950.**

POWER SHOW — 19th National Exposition of Power and Mechanical Engineering, sponsored by the American Society of Mechanical Engineers, in conjunction with the sooiety's annual meeting, at Grand Central Palace, New York, N. Y. Charles F. Roth, president, International Exposition Company, Grand Central Palace, New York.....**NOVEMBER 27—DECEMBER 2, 1950.**

ASRE MEETING—Annual convention of the American Society of Refrigerating Engineers, at Hotel Commodore, New York. M. C. Turpin, secretary, 40 W. 40th St., New York 18, N. Y. .....**DECEMBER 3-6, 1950.**

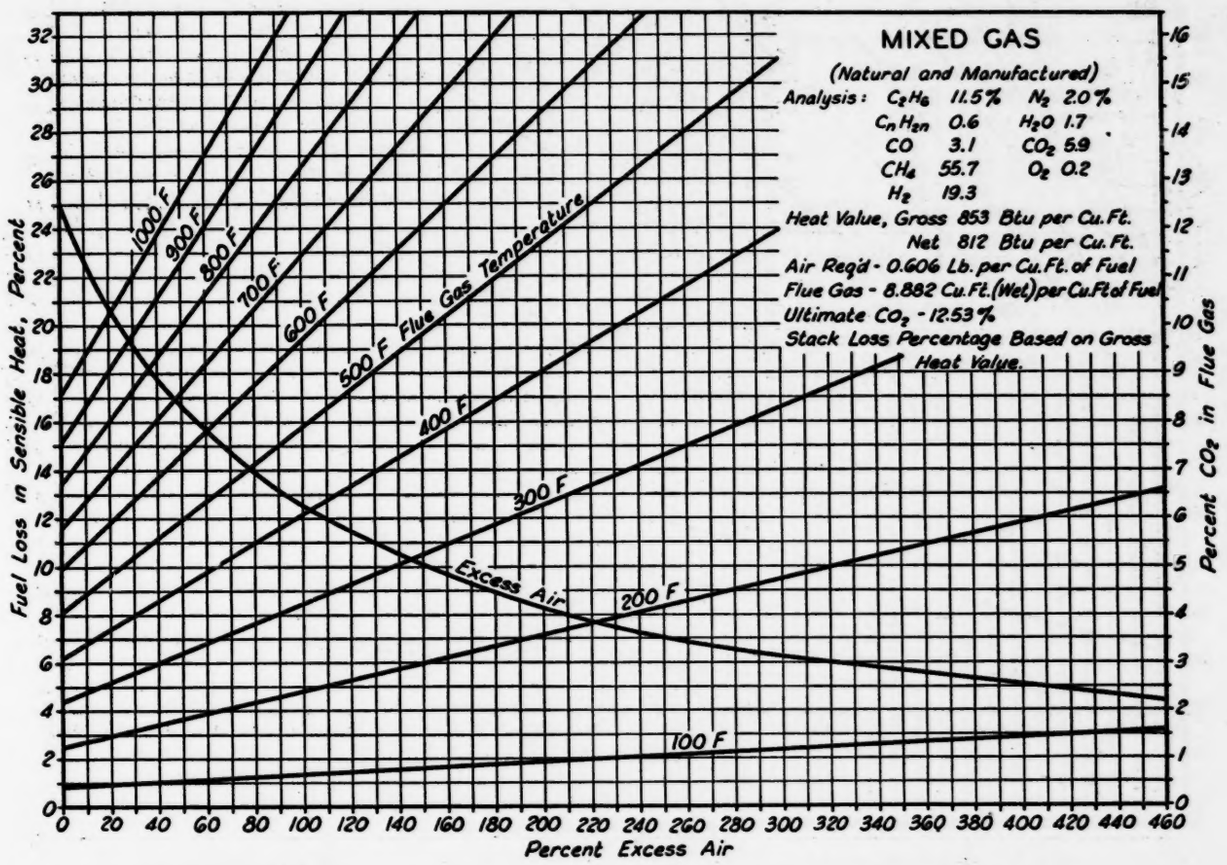
ASHVE EXPOSITION AND MEETING—57th annual meeting of the American Society of Heating and Ventilating Engineers, in conjunction with the 10th International Heating and Ventilating Exposition, at the Bellevue-Stratford, Philadelphia, Pa. A. V. Hutchinson, secretary of the Society, 51 Madison Ave., New York 10, N. Y. .....**JANUARY 22-26, 1951.**

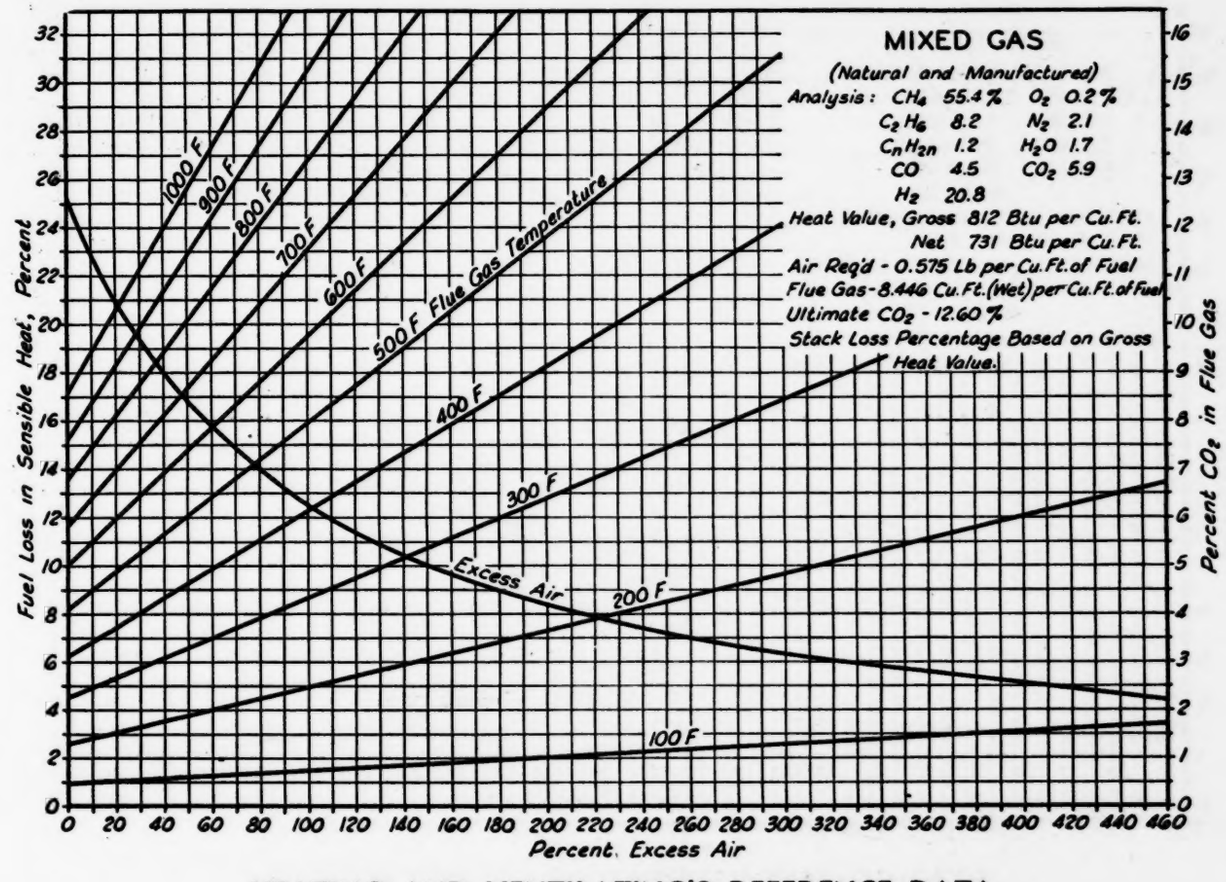
REFRIGERATION SHOW—7th All-Industry Refrigeration and Air Conditioning Exposition, at Navy Pier, Chicago, Ill. Show director, REMA, 1346 Connecticut Ave., N.W., Washington, D. C. .....**NOVEMBER 5-9, 1951.**

Bind in

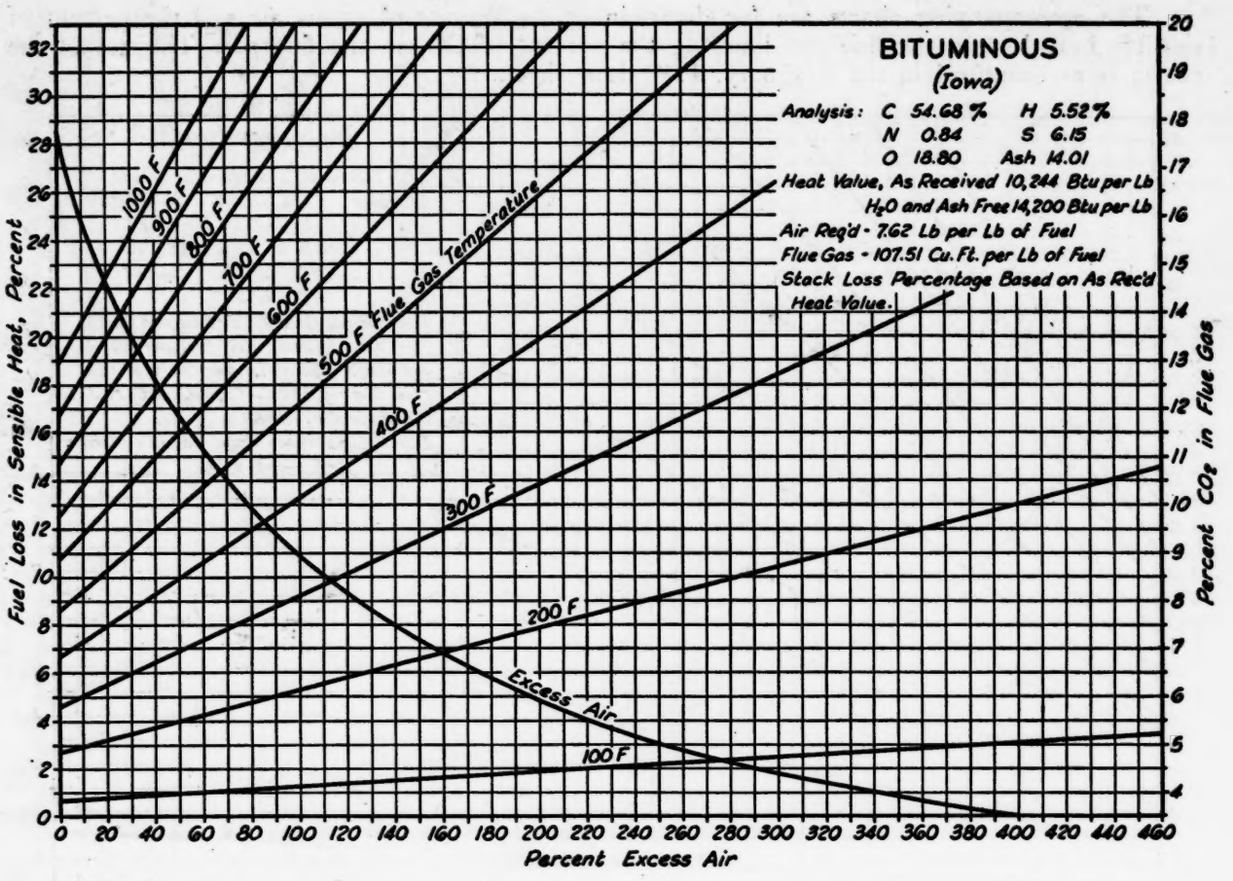
SENSIBLE HEAT LOSS IN FLUE GAS — MIXED GASES

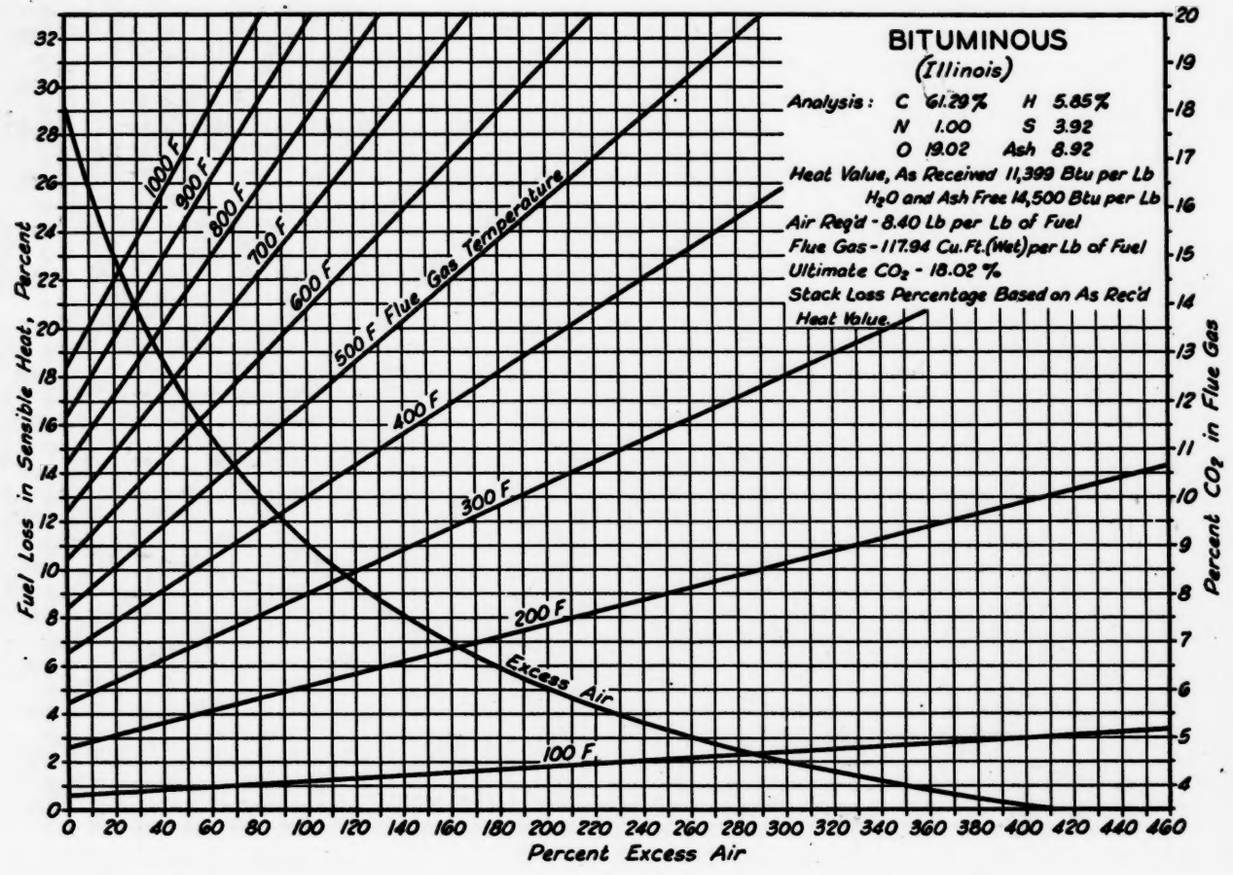
The accompanying charts are for determining the amount of excess air and the percent of sensible heat loss in the flue gas knowing the percent of CO_2 in the flue gas. The use of the charts is as described in the February, 1949 data sheet.





HEAT LOSS IN FLUE GAS — BITUMINOUS GASES


BITUMINOUS
(Iowa)
Analysis: C 54.68 % H 5.52 %
N 0.84 S 6.15
O 18.80 Ash 14.01
Heat Value, As Received 10,244 Btu per Lb
H2O and Ash Free 14,200 Btu per Lb
Air Req'd - 7.62 Lb per Lb of Fuel
Flue Gas - 107.51 Cu. Ft. per Lb of Fuel
Stack Loss Percentage Based on As Rec'd Heat Value.
1000 F
900 F
800 F
700 F
600 F
500 F Flue Gas Temperature
400 F
300 F
200 F
Excess Air
100 F
Fuel Loss in Sensible Heat, Percent
Percent CO2 in Flue Gas
Percent Excess Air


BITUMINOUS
(Illinois)
Analysis: C 61.29 % H 5.85 %
N 1.00 S 3.92
O 19.02 Ash 8.92
Heat Value, As Received 11,399 Btu per Lb
H2O and Ash Free 14,500 Btu per Lb
Air Req'd - 8.40 Lb per Lb of Fuel
Flue Gas - 117.94 Cu. Ft. (Wet) per Lb of Fuel
Ultimate CO2 - 18.02 %
Stack Loss Percentage Based on As Rec'd Heat Value.
1000 F
900 F
800 F
700 F
600 F
500 F Flue Gas Temperature
400 F
300 F
200 F
Excess Air
100 F
Fuel Loss in Sensible Heat, Percent
Percent CO2 in Flue Gas
Percent Excess Air

HEATING AND VENTILATING